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Ball Bushings for Linear Motion
Double Wall Tubing
Measuring Idle Time
Induction Hardening Steel

STEEL

The Magazine of Metalworking and Metalproducing

VOL. 120, NO. 3 JANUARY 20, 1947

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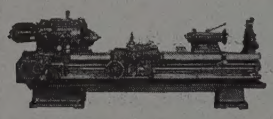
WHEELABRATOR NATIONALLY USED FOR NATIONALLY KNOWN PRODUCTS

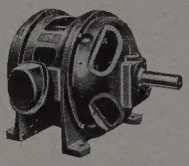
The list of manufacturers, coast to coast, who depend on the Airless Wheelabrator for faster, more thorough cleaning of castings reads like a "Who's Who" of Industry. The varied types of castings cleaned covers practically the entire field of metal products.

Besides the "case histories" illustrated, Allis-Chalmers . . . General Electric . . . General Motors . . . International Harvester . . . Bendix . . . U. S. Steel . . . are but a few of the long list of progressive manufacturers using the Wheelabrator. Write today for full information on how the Airless Wheelabrator can be applied to your cleaning problems.



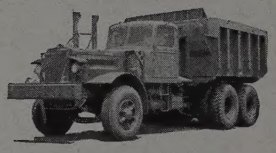
LODGE & SHIPLEY LATHES

Machine tool castings up to 420 pounds each are cleaned on a No. 3 Wheelabrator Multi-Table at Lodge & Shipley Machine Tool Co., Cincinnati. Although all castings are purchased outside they are Wheelabrated to insure a perfectly clean surface prior to machining and grinding.



WESTINGHOUSE ELECTRIC MOTORS

Motor frames, brackets, end plates and housings are just a few of the many types of castings which are Wheelabrated at Westinghouse Electric Co. Low operating costs and speed cleaning performance are reasons why Wheelabrators are chosen by Westinghouse for their cleaning requirements.

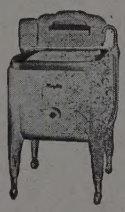


MACK TRUCKS

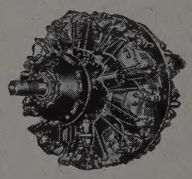
At the Mack Mfg. Corp., New Brunswick, N. J., two 48" x 72" Wheelabrator Tumblasts speed the cleaning of large and small truck castings. These castings consist of cylinder blocks, heads, transmission cases, water pump housings, etc. Cleaning time varies from 8 to 12 minutes depending upon the size and shape of pieces handled.

WHEELABRATOR TUMBLASTS
Eight standard sizes ranging from 1 cu. ft. to 63 cu. ft. capacity for cleaning loads in which individual pieces may vary from a fraction of an ounce to over 1,000 lbs. each.
WHEELABRATOR TABLES
Made in Plain Table and Multi-Rotary Table Types and in numerous standard sizes for cleaning flat or fragile work that is not adapted to tumbling.
WHEELABRATOR SPECIAL CABINETS
Cabinets are designed for special production requirements or where work cannot be adapted to a standard machine. Examples: cylinder blocks, bath tubs, crankshafts, etc.

MAYTAG WASHERS



Typical Maytag washer castings cleaned in Wheelabrator equipment at the Maytag Co., Newton, Iowa, include: wringer frames, locks, heads, and uncut gears. These parts are cleaned in a 27" x 36" Wheelabrator Tumblast in a fraction of the time formerly required with an airblast table and several barrels.



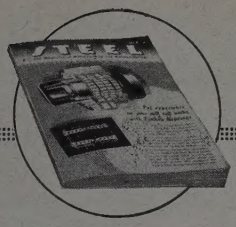
WRIGHT CYCLONE ENGINES

Wright cyclone aircraft engines that must be corrosion-proofed for sea duty are metallized. To obtain the correct bond for this operation the surfaces of the deep finned cylinders are Wheelabrated in specially designed machines. 93 Wheelabrators are in operation at their various plants.

American
WHEELABRATOR & EQUIPMENT CORP.
(Formerly American Foundry Equipment Co.)

509 S. Byrkit St.
Mishawaka, Indiana

WORLD'S LARGEST BUILDERS OF AIRLESS BLAST EQUIPMENT



January 20, 1947

Portal-to-Portal Suicide

Now that the total amount claimed by unions in their hundreds of suits for retroactive portal-to-portal pay exceeds $4 billion, it may be well to take another look at this unusual situation to see whether or not it makes sense to anybody.

One would assume that inasmuch as union leaders instigated the suits, they must see in them some hope of benefits for the members of unions. On what basis can this hope be entertained? If the union should be successful in its suit against a company that cannot pay the amount claimed and if that company is forced to go out of business, what benefit can union members receive as a result of their legal victory?

Again, suppose that the union wins its suit against a company that is strong enough financially to pay the claim. In this case some employees would receive some cash, but the ability of the employer to meet current payrolls, to meet pay demands of the future and to maintain his business in a way that would insure stability in employment would be seriously impaired. It is difficult to see how union members could gain any long-term benefits.

It is possible that the union leaders who master-minded this wave of suits believed that their cleverness and enterprise would win new prestige for union leadership. If they really entertained any such idea, they were exceedingly naive because the portal-to-portal suits now are arousing public criticism. Worse yet, members of some unions are beginning to demand that suits that have been filed be withdrawn. In some instances, the members of locals have voted unanimously to drop legal action that had been initiated by regional or national union officials.

This is another indication of the fact that on many issues the men in a plant, who are familiar with what is involved in union actions affecting that plant, usually are more level-headed and more realistic than the national leaders who issue orders from a distant office building.

With a few possible exceptions, the portal-to-portal pay suits now pending have no moral justification. They reflect the hasty and ill-advised decisions of a few union officials, some of whom probably realize by now that they blundered. The sooner union leaders abandon or scale down to a level of fairness the suits they have filed, the sooner they will reverse the unfavorable trend of public reaction to their behavior.

• • •

WAGES AND TARIFFS: Sooner or later many industrialists will come to grips with problems that are bound to arise from the necessity of evolving a sound program of postwar international trade.

A typical foretaste of what is in store is afforded by preliminary discussions on proposed tariffs on tool steel. The tariff committee of the tool and fine steel industry of the United States is opposing the tentative trade agreements that would reduce the tariffs on imports of these products into this country.

One argument put forth by the committee is the disparity between wages in the United States and those in the European countries from which tool and fine steels would be imported. For instance, average earnings in the American tool and cutlery industry in August of 1946 exceeded $1.06 per hour. In contrast, comparable wages in the United Kingdom averaged only 40.2 cents per hour. In Belgium and in some other countries on the continent the average wage in this industry was even lower.

This wage differential is more important in some industries than in others. Much depends upon the

(OVER)

extent to which the efficiency of machines and methods offsets the factor of hourly wages.

We suggest that manufacturers who expect to engage in foreign trade begin immediately to study the tariff situation. It will be a hot topic during the next few years. —pp. 41, 48

* * *

MATERIALS HANDLING: Thousands of manufacturers went to Cleveland last week to see the first National Materials Handling Exposition and to hear discussions at the Conference on Materials Handling. They found both events to be of timely importance.

One reason for this is that if manufacturing methods are to keep pace with recent advances in production and machining techniques, more efficient means must be employed in the moving, lifting, loading and stacking of materials and parts. Another reason is that with labor costs at their present level, it is not economical to permit a high-priced man to do manual lifting, feeding or discharging of materials or work in process that can be done by mechanical means.

The Cleveland exposition and conference served a most constructive purpose in that it helped to drive home to industrial executives the fact that materials handling has become a primary operation in the modern scheme of American manufacturing. —p. 92

* * *

FBI CRIME LABORATORY: Metallurgists probably will be as much surprised as laymen at the revelation that the science of the examination and analysis of metals has become an important ally in the detection of crime. Many techniques which are commonplace routine in industrial laboratories are being utilized to great advantage by the Federal Bureau of Investigation.

In a single year FBI conducted 67,229 metallurgical examinations in its law enforcement work. When the office of a furniture manufacturer was wrecked by a bomb and an employee killed, FBI agents traced the murderer by means of metallurgical examinations of the crude metal parts of the booby trap. When a burglar cut a telephone wire as a prelude to his crime, the FBI spectrographic analysis of the suspect's pocket knife revealed telltale traces of copper which convicted him.

The expected increase in crime following the end of the war now is materializing. The FBI use of modern metallurgical equipment is all set to cope with this challenge. —p. 52

SIGNS OF THE TIMES: War Assets Administration has transferred 247 additional models of machine tools to its fixed price register (p. 44), thus making them available at prices ranging from 25 to 40 per cent below the prices at which they were held under the Clayton formula. . . . Western railroads are filing schedules with the Interstate Commerce Commission which, if approved (p.61), will reduce freight rates on steel shipped from Geneva, Utah, to Los Angeles, San Francisco and Portland from $12.20 to $9.60 per ton and from Geneva to Seattle from $14 to $10.80 per ton. . . . Do not be too much surprised if statistical methods make remarkable headway in industry during the next few years. The control chart method won new converts during the war. Now some manufacturers are expanding it (p. 82) to include control of variables in widely divergent production, processing and finishing operations and of accidents, manhours, efficiency and similar factors. Punch card tabulating systems are part of this new set-up. . . . Assuming that the average automobile requires about two tons of steel, gross, in its manufacture, it would appear that the recent increases in base prices and the revisions in extra cards (p. 55) will add at least $25 to the cost of a car. . . . Speaking of extras on steel products, producers and consumers alike will find it profitable to study carefully the interpretations of the revisions in extras that probably will be forthcoming with increasing frequency during the next few weeks. The first of these, pertaining chiefly to quality extras on hot-rolled carbon steel bars (p. 46), sheds light on a few points that have been puzzling buyers and sellers. . . . First industrial application of television is at Consolidated Edison's Hell Gate power plant in New York where a photographic record of the height of the water in the water gage of a boiler (p. 101) is reproduced on a screen at a control panel several blocks away. It is predicted that television will be useful in the observation of dangerous processes and experiments in many branches of industry, including radioactive substances in atomic power applications. . . . Recovery from the yearend letdown in industrial activity is encouraging. Gains in production of coal, steel and automobiles and in revenue freight car loadings have lifted STEEL's index of industrial production to 153 (p. 120) which is only 5 points under the postwar high of 158.

E. L. Shaner

EDITOR-IN-CHIEF

Workers at Carnegie-Illinois Steel Corp.'s Gary sheet and tin mill weigh and package tin plate destined for the nation's canning industry. The hungry of most every land receive food packaged in tin plate made at this plant

Steel Mills' Order Books Loaded

Supply conditions expected to ease gradually but acute shortages in certain items, especially flat-rolled, are likely to continue throughout year. Government officials estimated finished steel shortages of 6 million tons

STEEL supply is expected to improve om month to month but indications st week were that the improvement ill be so gradual as to be scarcely oticeable before midyear. New business ontinues to press on the market, the ills entering January with order books ulging despite the wiping out of much acked-up tonnage which had accumuted throughout 1946.

No material easing in light gage flatolled steel supply conditions appears kely before well on toward yearend, if en. Considerable new flat-rolling capaty is scheduled to come into operation ver the next few months but demand in is division continues beyond producing apacity, and unless consumers limit deands to actual needs mill books are ertain to continue over-loaded in this ategory.

Barring a work stoppage, steelmakers xpect to produce in excess of 80 million ns of ingots during 1947. This would top 1946 output by close to 25 per cent and would be record-breaking for peacetime. However, production on such a scale is dependent not only upon the absence of work stoppages but also upon the ability of the mills to obtain scrap and coke in sufficient quantities to support near-capacity operations.

Steel buyers are expected to exert more caution in buying than was the case in 1946 because of the sharp increase in prices which has been effected in recent weeks. Purchasers also are less likely to duplicate orders to the extent experienced last year, and considerable backed-up tonnage may be removed from mill books. All of which should tend to lessen pressure for shipments while limiting of government priorities should permit order in rolling and shipping schedules to a much higher degree than was possible throughout 1946.

At a recent meeting of the Civilian Production Division of the Office of Temporary Controls and the Steel Products Industry Advisory Committee, government officials estimated that finished steel production this year will fall short of requirements by about 6 million tons. Output for the year is expected to total 60,900,000 product tons against an estimated demand for 67 million tons. In 1946, finished steel production totaled about 47 million tons.

Unusually heavy demand for plates and sheets is in prospect from the railroads. Car shortages are acute and the need for adding new rolling stock is so pressing the railroads are exerting every effort to step up car production. Car order backlogs are tremendous, something like 82,000 units for domestic account, and 35,000 for foreign buyers being on order books.

It is hoped to raise car production from the recent level of 3100 units per month to 7000. This, however, only can be done if more steel is diverted to this program, and a diversity of products is required, most of them of the scarce category. Chief difficulty is expected in plate and sheet supply but car wheels and axles also are tight. Railroad specialties, it is understood, today are being

quoted for second and third quarter delivery.

Practically every consuming line is having difficulty in obtaining flat-rolled steel in desired quantities. The automotive industry which is hoping to up production this year beyond 5 million units is having much the same supply difficulty it encountered all last year (see page 55). Housing needs are far from satisfied and miscellaneous manufacturing industries find little to cheer about in the supply outlook.

Producers continue to stick as rigidly as possible to their quota distributing plan which is based upon prewar order volume. As a result many consumers are finding it impossible to obtain larger tonnages of metal to care for expanded demand for their products as compared with their prewar volume. New businesses find it extremely difficult to make supply connections and the situation is further complicated by the tendency of the mills to confine business as close to producing plants as possible, thus holding freight absorption to a minimum.

At the recent industry advisory committee meeting steel company officials indicated they favor discontinuance of all priority programs after Mar. 31, since they feel all essential requirements can be met. They also opposed the National Housing Administration's proposed premium payment plan on galvanized and steel sheets, holding that the plan would simply be "robbing Peter to pay Paul." Emphasizing production of these items, it was said, would seriously curtail output of other vitally needed products.

The NHA premium proposal calls for payment of $10 per ton produced in excess of average monthly third quarter output, and an additional $10 premium for shipments in excess of those normally made to the West Coast.

The War Department has discontinued use of the HH rating for military housing. Also it is discontinuing the MM rating. The contracts to which these ratings apply on Dec. 31, last, will retain those priority ratings throughout their life or until such time as all governmental preference ratings are discontinued. Granting of CC ratings already has been drastically restricted and in the future the CPA will issue these ratings only for nondeferable military requirements, essential community needs and for veterans housing.

Peak Output of Porcelain Enamel Goods To Continue

Peak production of porcelain enameled metal-base products is expected to continue throughout 1947, the Porcelain Enamel Institute, Washington, says.

Shipments in November were valued at $7,814,134, production that month being nearly double the volume of November, 1945. Shortages of basic materials including steel enameling sheets were reported as the most important factors in preventing the November, 1946, shipments from being even higher.

Steel Production in 1946 of More Than 66 Million Tons Reported

DESPITE the handicap imposed by major strikes in 1946, the steel industry turned out 66,363,848 net tons of ingots, representing an average operating rate of 72.2 per cent of capacity, according to the American Iron & Steel Institute.

Although this figure is 17 per cent below the 79,701,624 tons produced in 1945 when operations averaged 83.5 per cent of capacity, it represents a higher peacetime output than for any year prior to 1940.

December production of 5,700,997 tons, equivalent to 73.2 per cent of capacity for that month, declined below the November output of 6,409,675 tons when operations averaged 84.8 per cent. Production in both months was affected adversely by the second coal strike during 1946. Because of this second coal strike and earlier strikes in the steel and coal industries, monthly steel production exceeded the six million-ton mark in six months of the year.

Fourth quarter, 1946, production of 19,020,269 tons, representing an 82.1 per cent average operating rate, topped the 1945 fourth quarter output of 17,855,179 tons when operations averaged 74.2 per cent of capacity.

STEEL INGOT PRODUCTION STATISTICS

Based on reports by companies which in 1945 made 97.6% of the open hearth, 100% of the bessemer and 85.8% of the electric ingot and steel for castings production

	Estimated Production—All Companies								Calculated weekly	
	—Open Hearth—		—Bessemer—		—Electric—		—Total—		produc-	Num-
1946	Net tons	Per cent of capac.	Net tons	Per cent of capac.	Net tons	Per cent of capac.	Net tons	Per cent of capac.	tion all companies Net tons	ber of weeks in mo.
Jan.	3,528,090	51.1	207,512	47.4	136,452	29.2	3,872,054	49.6	874,053	4.43
Feb.	1,300,944	20.9	25,905	6.6	65,668	15.6	1,392,517	19.8	348,129	4.00
March ..	5,946,698	86.2	363,949	83.1	196,400	42.0	6,507,047	83.3	1,468,859	4.43
1st qtr...	10,775,732	53.8	597,366	47.0	398,520	29.4	11,771,618	51.9	915,367	12.86
Apr.	5,333,139	79.8	286,088	67.5	241,031	53.3	5,860,258	77.5	1,366,028	4.29
May	3,699,979	53.6	153,409	35.0	219,064	46.9	4,072,452	52.2	919,289	4.43
June ...	5,145,594	77.0	251,253	59.2	227,979	50.4	5,624,826	74.4	1,311,148	4.29
2nd qtr..	14,178,712	69.9	690,750	53.7	688,074	50.1	15,557,536	67.9	1,195,814	13.01
1st 6 mos.	24,954,444	61.9	1,288,116	50.4	1,086,594	39.8	27,329,154	59.9	1,056,403	25.87
July	6,016,253	87.4	365,332	83.6	228,083	48.9	6,609,668	84.9	1,495,400	4.42
Aug. ...	6,251,271	90.6	373,837	85.4	261,755	56.0	6,886,863	88.2	1,554,597	4.43
Sept. ...	5,911,375	88.6	371,465	87.8	235,054	52.1	6,517,894	86.4	1,522,872	4.28
3rd qtr. .	18,178,899	88.9	1,110,634	85.6	724,892	52.3	20,014,425	86.5	1,524,328	13.13
9 mos. ..	43,133,343	71.0	2,398,750	62.2	1,811,486	44.0	47,343,579	68.9	1,213,938	39.00
Oct.	6,268,102	90.8	387,933	88.6	253,562	54.3	6,909,597	88.5	1,559,728	4.43
Nov. ...	5,822,670	87.1	318,350	75.1	268,655	59.4	6,409,675	84.8	1,494,097	4.29
*Dec. ..	5,231,359	76.0	222,782	51.0	246,856	52.9	5,700,997	73.2	1,289,818	4.42
*4th qtr..	17,322,131	84.6	929,065	71.5	769,073	55.5	19,020,269	82.1	1,447,509	13.14
*2d 6 mos.	35,501,030	86.7	2,039,699	78.5	1,493,965	53.9	39,034,694	84.3	1,485,904	26.27
*Total ..	60,455,474	74.4	3,327,815	64.6	2,580,559	46.9	66,363,848	72.2	1,272,801	52.14
*Preliminary figures.										
1945										
Jan.	6,469,340	90.5	379,062	76.0	355,910	76.8	7,204,312	88.8	1,626,256	4.43
Feb.	5,968,326	92.4	347,227	77.1	337,212	80.6	6,652,765	90.8	1,663,191	4.00
Mar.	6,927,939	96.9	398,351	79.8	379,639	81.9	7,705,929	95.0	1,739,487	4.43
1st qtr...	19,365,605	93.3	1,124,640	77.6	1,072,761	79.7	21,563,006	91.5	1,676,750	12.86
Apr.	6,541,627	94.5	372,952	77.2	375,308	83.6	7,289,887	92.8	1,699,274	4.29
May	6,664,117	93.2	402,100	80.6	383,450	82.7	7,449,667	91.8	1,681,640	4.43
June	6,129,763	88.5	379,807	78.6	330,952	73.7	6,840,522	87.1	1,594,527	4.29
2nd qtr..	19,335,507	92.1	1,154,859	78.8	1,089,710	80.0	21,580,076	90.6	1,658,730	13.01
1st 6 mos.	38,701,112	92.7	2,279,499	78.2	2,162,471	79.9	43,143,082	91.0	1,667,688	25.87
July	6,318,975	88.6	361,832	76.7	284,764	61.6	6,965,571	86.3	1,580,446	4.42
Aug.	5,172,344	72.3	347,068	69.5	215,885	46.6	5,735,317	70.7	1,294,654	4.43
Sept.	5,435,799	78.7	352,847	73.2	193,829	43.3	5,982,475	76.3	1,397,775	4.28
3rd qtr...	16,927,118	79.9	1,061,767	73.1	694,478	50.5	18,703,363	77.8	1,424,475	13.13
9 mos....	55,628,230	88.4	3,361,266	76.5	2,856,949	70.0	61,846,445	86.6	1,585,806	39.00
Oct.	5,146,787	72.0	242,122	48.5	207,867	44.8	5,596,776	69.0	1,263,381	4.43
Nov.	5,641,808	81.5	358,664	74.2	200,494	44.7	6,200,466	78.9	1,445,330	4.29
Dec.	5,523,277	77.4	343,266	68.9	191,394	41.4	6,057,937	74.8	1,370,574	4.42
4th qtr...	16,311,872	76.9	944,052	63.8	599,755	43.6	17,855,179	74.2	1,358,842	13.14
2d 6 mos.	33,238,490	78.4	2,025,819	68.5	1,294,233	47.1	36,558,542	76.0	1,391,646	26.27
Total ...	71,939,602	85.5	4,305,318	73.3	3,456,704	63.4	79,701,624	83.5	1,528,608	52.14

For 1945 percentages are calculated on weekly capacities of 1,614,338 net tons of open hearth, 112,658 tons of bessemer and 104,640 tons of electric ingots and steel for castings, total 1,831,636 tons; based on annual capacities as of Jan. 1, 1945 as follows: Open hearth 84,171,500 net tons, bessemer 5,874,000 tons, electric 5,455,890 tons.

For 1946 percentages are calculated on weekly capacities of 1,558,041 net tons open hearth, 98,849 net tons bessemer and 105,491 net tons electric ingots and steel for castings, total 1,762,381 net tons; based on annual capacities as of Jan. 1, 1946, as follows: Open hearth 81,236,250 net tons, bessemer 5,154,000 net tons, electric 5,500,290 net tons, total 91,890,540 net tons.

Tool and Fine Steel Industry Protests Proposed Tariff Cuts

Cites lower wage rates paid foreign workers in opposing concessions in reciprocal trade agreements with United Kingdom, France, Belgium, the Netherlands, Norway, Czechoslovakia. Fifteen producers represented in protest

PROPOSED trade agreements that would reduce tariffs on imports of tool and fine steels into the United States are being opposed by the tariff committee of the tool and fine steel industry of the U. S.

The committee cites the proposed agreements as detrimental to American workers' wages and standard of living and the national security.

In support of the protest a 22-page report has been issued by the committee which is comprised of A. T. Galbraith, vice president, Crucible Steel Co. of America, New York; Roy C. McKenna, chairman, Vanadium-Alloys Steel Co., Latrobe, Pa.; and J. Heber Parker, president, the Carpenter Steel Co., Reading, Pa.

The proposed reciprocal trade agreements which the committee is opposing relate to the United Kingdom, France, Belgium, the Netherlands, Norway, Czechoslovakia, Canada, and other countries. Not included in the present negotiations are Sweden, Germany and Switzerland, the former two countries being America's principal foreign competitors in the tool and fine steel industry in the decade preceding World War II.

Committee Dislikes Omissions

Omission of Sweden, Germany and Switzerland in the current negotiations is repugnant to the committee because, says the committee, it is proposed to increase the number of countries competing with the American tool and fine steel industry while not making any reduction in the competition from the principal competitors. "This," says the committee, "does not seem to be in harmony with the general principle of what has long been referred to as reciprocity. In other words, when the principle of reciprocity is under discussion, all negotiations must be carried on with the principal foreign suppliers of competitive imports."

Particularly disturbing to the committee is the fear that if a new series of concessions are granted in agreements with the United Kingdom and Canada, or Czechoslovakia, Belgium and France they may in turn be extended to such other countries as Sweden and Germany, principal competitors.

The committee represents 15 United States companies in the tool and fine steel industry. The 15 companies are: Braeburn Alloy Steel Corp., Braeburn, Pa.; the Carpenter Steel Co., Reading, Pa.; Columbia Tool Steel Co., Chicago Heights, Ill.; Crucible Steel Co. of America, New York; Henry Disston & Sons Inc., Philadelphia; Firth-Sterling Steel & Carbide Corp., McKeesport, Pa.; Jessop Steel Co., Washington, Pa.; Ingersoll Steel & Disc Co., Newcastle, Ind.; Latrobe Electric Steel Co., Latrobe, Pa.; Allegheny Ludlum Steel Corp., Brackenridge, Pa.; the Midvale Co., Nicetown, Philadelphia; Simonds Saw & Steel Co., Fitchburg, Mass.; Universal-Cyclops Steel Corp., Bridgeville, Pa.; Vanadium-Alloys Steel Co., Latrobe, Pa.; and Vulcan Crucible Steel Co., West Aliquippa, Pa.

Chief reason cited for the need of substantial tariff protection for American producers of tool and fine steels is low wages paid by foreign producers. The committee pointed out, for instance, that U. S. industries engaged in manufacture of hand tools and cutlery paid an average of $1.06 an hour, whereas in the United Kingdom the average was only 40.2c an hour, while wages in Belgium have been substantially lower.

Industry's Views on Proposed Reciprocal Trade Agreements Are Presented at Hearings

HEARINGS on prospective reciprocal trade agreements with 18 countries were begun Jan. 13 in the Tariff Commission Auditorium, Washington, and for three days were devoted to presentation of the view of various members of Congress, of representatives of chambers of commerce and of various associations and general groups.

On Jan. 16 the proceedings were spread out over five panels in simultaneous hearings in various auditoriums in Washington and will continue through Jan. 31. It is expected the hearings will come to an end on that date. The five groups embrace: Chemicals and forest products; metals and minerals; agriculture; textiles and fibers and sugar and fisheries; and ceramics.

Metals Panel Considers Long List

The metals and minerals panel is scheduled to hear recommendations for tariff rates on crude and calcined magnesite, graphite, graphite crucibles, clock movements, asbestos products, scrap mica, cut and stamp mica, limestone spalls, talc, fluorspar, bituminous coal, anthracite coal, cast iron pipe, fluorspar, manganese ore, tungsten ore, iron and steel products, ferromanganese, nickel alloy steels, nickel alloys, tool steels, fine alloy steels, cerium products, ferrosilicon, copper lead, zinc, antimony, nickel-cadmium batteries, aluminum and alloys, bauxite, aluminum products, zirconium, abrasives, antifriction bearings, power transmission chains, upholsterers' nails, chair glides, thumb tacks, corset hardware, metal buckles, bronze products, meat and food choppers, engraved plates, blueprinting equipment, engraving equipment, photographic equipment, voice-recording and amusement machines, wall paper rollers, saddlery hardware, hooks and eyes, snap and slide fasteners, buttons, pins, hairpins, safety and common pins, air and gas compressors, pneumatic tools, drills and pumps, electric measuring instruments, transformers, electrical generators and transformers, telephone apparatus, electrical products, electrical insulators, cathode ray tubes, bare and insulated wire and cables, flashlights, scientific apparatus, optical instruments, precision mathematical instruments, woodworking instruments, metal cutting tools, fire arms, sporting arms, motorcycles, bicycles, truck trailers, heat exchanger equipment, cooking and heating appliances, power cranes, power shovels, industrial pumps, diesel engines, mechanical presses, machine tools, broaching tools, card clothing, textile machinery and accessories, sewing machines, office machinery, tobacco machines, bottle caps, collapsible tubes, sprinkler caps, galvanized woven wire netting, woven wire cloth, cyclider faces, steel pen nibs, mechanics' hand tools, axes, hatchets, hammers, machine knives, pocketknives, cutlery, safety razor blades, automatic razor blades, hypodermic needles, dental instruments, silverware, safes, horseshoes, farm wagons and trailers, farm equipment, conveyors and parts, diamond dies.

Peaceful Steel Wage Settlement Seen

Negotiations to start early this week. Unions to watch effect of working of free collective bargaining on Congress and pending labor legislation

QUIET confidence that a new steel wage contract will be signed without too much wrangling and particularly without a strike is apparent in the attitudes of both management and labor as they prepare to open negotiations early this week.

Discussions between the United Steelworkers of America-CIO and the steel-producing subsidiaries of the United States Steel Corp. were scheduled to start on Jan. 16 in Pittsburgh, but were postponed by mutual consent. While both management and labor spokesmen were silent on the reasons for the postponement, it is known that a number of informal conferences on the issues of the case already have been held and some observers believe the postponement was made to allow time to settle some of the issues before the formal negotiations start.

Whatever agreement is reached between the U. S. Steel subsidiaries and the union is generally expected to indicate the pattern for the remainder of the steel industry and probably will have an important influence on wage negotiations in other metalworking industries.

Counter Demands Expected

When negotiations open this week, the U. S. Steel subsidiaries are expected to present a number of counter demands and to ask the negation of certain of the union's demands. Then the discussions probably will settle down to the matter of wage rates and whatever other union demands remain, including union security.

Guesses as to the eventual outcome of the negotiations are a dime a dozen. Most commentators predict the union will win a modest increase. However, both management and union officials meticulously avoided naming any figure which they would consider satisfactory.

In this respect, the steelworkers' union spokesmen have been more careful than the heads of other major unions. The union simply has stated that it will ask for a "substantial" wage increase and has parried all questions as to how much would constitute such a raise. The United Automobile Workers, on the other hand, have laid down a flat demand for 23½ cents hourly, and the United Electrical, Radio & Machinery Workers have hinted at an $11.72 weekly increase demand.

Sen. Joseph H. Ball (Rep., Minn.), a leader in formulating new labor legislation in the Senate, explains provisions of his bill to prevent the use of monopolistic practices in collective bargaining and to amend the Wagner Act. NEA photo

Collective bargaining conferences this year will differ greatly from those held a year ago. For the first time since imposition of wartime controls, the discussions will be free from government direction. In recent years, the administration virtually has dictated the terms of wage contracts.

This year, the administration will observe a strict hands off policy, and the strength of the union will be reduced accordingly.

Leaders of the steelworkers repeatedly have indicated their desire to settle the issue without a strike. Although strike notices were filed last week in conformity with the requirements of the Smith-Connally Act, union leaders were careful to point out that this was only a mechanical precaution and indicated no intention of striking.

The union will press for as large an increase as it can obtain by use of persuasion. It will argue its case on the increase in living costs and on the profit position of the steel industry. It will base many of its arguments on the recently-publicized Nathan report and upon a special survey of the steel industry also made by Nathan.

However, the unions also will be keeping one eye on the Republican-controlled Congress and probably will stop short of further antagonizing that body by calling new work stoppages that might result in severe antiunion legislation.

Judging by recent union publications, labor leaders currently are more concerned over probable antiunion laws than over obtaining wage increases for members. The Jan. 13 issue of *The CIO News*, for example, devotes six full pages to stories on "Union-Busting on Capitol Hill," "The Drive Against Labor," "Plan To Railroad Anti-Labor Bill," and "Anti-Labor Lineup" and less than a page to stories on wages and contract negotiations.

An examination of the bills to restrict labor unions that have been pouring into the congressional hoppers in the past two weeks indicates the labor leaders' worries are well founded.

A variety of measures, ranging from bills to outlaw portal-to-portal pay suits

compulsory arbitration, from outlaw-
g the closed shop to elimination of
dustry-wide bargaining, have been in-
oduced. Hearings on these bills will
rt before the Senate Labor Commit-
e Jan. 23 and Chairman Robert A.
ft has set Mar. 1 as the deadline for
mpletion of hearings.

The Senate Labor Committee will
ncentrate on the Ball-Taft-Smith medi-
on bill and the Murray bill calling for
special commission to study the entire
ld of labor relations. The Murray
ll is in line with President Truman's
commendations in his recent state-of-
e-union message. The Ball-Taft-Smith
ll is a revised version of the Case bill
hich was vetoed by President Truman
the last session.

In addition to these measures, the
mmittee will have simultaneous hear-
gs on all other bills whose objects are
reduce industrial strife. These mea-
res are classified by the committee as
ose dealing with:

1—The organization and responsibility
labor unions.

2—Proposals for labor courts and com-
lsory arbitration.

3—Mediation and conciliation pro-
osals.

4—Measures dealing with the closed
op and industry-wide bargaining.

5—Bills amending the National Labor
elations (Wagner) Act.

Pay Suits Pose Problem

Means of dealing with the portal-to-
rtal pay issue is one of the most diffi-
lt jobs confronting the Congress. Claims
suits against employers now exceed
billion, with more in preparation.

Although L. Metcalfe Walling, ad-
inistrator of the wage-hour law, under
hich the suits are filed, says the claims
e "grossly exaggerated" and that the
timate liability would be only a small
action of the amounts now being talked
out, the suits have become a national
nnoyance and a number of bills have
en introduced in Congress to outlaw
restrict such suits. Among the pro-
osals are one by Sen. Alexander Wiley
ep., Wis.), another by Sen. Homer
Capehart (Rep., Ind.) and the re-
sed Gwynne bill. They involve such
ovisions as: 1—Barring suits for com-
nsation for time spent "in other than
oductive work;" 2—defining "work" as
rvices paid for under established plant
stom or by specific agreement between
orkers and employer; 3—limiting the
ability of employers whose failure to
ay all due compensation was an error
"good faith;" and 4—forbidding suits
lling for retroactivity beyond one year.
The latter feature is causing consider-
able perplexity; while it would be entirely in order to set a limit on retroactivity in cases still to be brought, there is a question whether application of this retroactivity limitation would be construed by the courts as constitutional. And if a law with such a stipulation were to be held unconstitutional, then it would have failed of its main purpose—which is to protect the solvency of the many employers against whom suits aggregating several billions have been entered on the basis of alleged violations of the Fair Labor Standards Act.

Because of this uncertainty on the matter of retroactivity in cases already in the courts, there is a disposition among some congressmen to await the outcome of the request of the National Association of Manufacturers that it be permitted to become a "friend of the court" in the precedent-establishing Mt. Clemens Pottery Co. "portal-to-portal" pay case. The NAM has asked United States Judge Frank A. Picard of Detroit to rule on the issue of retroactivity when he reports to the Supreme Court with respect to the precedent-establishing Mt. Clemens case.

The revised Gwynne bill, in addition to setting one year as the limit of retroactivity for damage awards under various federal statutes, has a provision aimed to discourage attorneys who would like to grow fat on such cases. Attorneys would be limited to a fee of 5 per cent of the award and under no circumstances could collect more than $5000 per individual case.

National Motorboat Show Well Attended in New York

Boats ranging in size from a 46-foot cruiser to 8-foot dinghies attracted the attention of the thousands of spectators at the National Motorboat Show which wound up its 37th appearance Saturday, Jan. 18, in New York's Grand Central Palace. Last held in 1941, the show made up for time lost during the war with the latest improvements in boats, accessories and all things nautical.

A total of 222 exhibitors displayed 175 craft, 50 engines including huge diesels and tiny outboard motors, and a wide assortment of boat fittings.

Present, Past and Pending

■ LUKENS STEEL PROFITS DROP SHARPLY IN 1946
COATESVILLE, PA.—Net profits of Lukens Steel Co. and subsidiaries for fiscal year ended Oct. 5 were $650.67, after income tax adjustments. In 1945, net profit was $2,751,-477.56.

■ ORDNANCE DEPARTMENT TO PLACE AMMUNITION ORDER
WASHINGTON—An order for 25 million rounds of small arms ammunition for production before June 30 will be placed soon by the Army. Order probably will go to Frankford Arsenal. Ordnance Department will hold a meeting with private manufacturers early in February to discuss allocation of ammunition contracts over next several years.

■ BABCOCK & WILCOX TO EXPAND RESEARCH PROGRAM
ALLIANCE, O.—Babcock & Wilcox Co., New York, has purchased a 140 x 300 ft building on a 20-acre site here and will concentrate all new research projects in it.

■ COPPER PRODUCTION OFF 22 PER CENT IN 1946
WASHINGTON—Copper production in 1946 was 22 per cent less than in 1945 and 45 per cent below the alltime peak established in 1943, according to the Bureau of Mines. Strikes were the principal cause for the decline.

■ GREEN OPPOSES PORTAL-TO-PORTAL SUITS
WASHINGTON—President William Green of the American Federation of Labor in a letter to AFL affiliates has opposed portal-to-portal pay suits as "untimely and unwarranted" and has advised members that any such claims should be settled later by collective bargaining.

■ FORD CUTS AUTOMOBILE PRICES $15 TO $50
DETROIT—Henry Ford II last week announced price reductions on Ford automobiles ranging from $15 to $50 as a "shock treatment" to halt the "insane spiral" of inflation.

■ CONTINENTAL REPORTS ENGINE SALES AT PEACETIME PEAK
DETROIT—Continental Motors Corp. reports sales of engines and parts exceeded $45 million in the fiscal year ended Oct. 31 to establish a new peacetime record.

■ UNION SEEKS 15 PER CENT COMMISSION ON PORTAL AWARDS
DETROIT—United Automobile Workers-CIO is reported obtaining commitments from workers involved in portal-to-portal pay suits to pay to the union a 15 per cent commission on any awards made by the courts.

Advisory Group Approves WAA Discount Plan

Proposes 12½ per cent discount on surplus tools to exporters and to dealers and builders purchasing for resale

PROPOSAL by the War Assets Administration to allow a 12½ per cent trade level discount on surplus machine tools to machine tool exporters, machine tool dealers purchasing for their own account for resale, and machine tool rebuilders and manufacturers purchasing for resale was approved last week by the Metalworking Machinery and Equipment Industry Advisory Committee.

Meeting with WAA officials committee members, leaders in the machine tool industry, agreed that the discount would materially increase the sale of surplus machine tools. It would be applicable also to WAA approved dealers when purchasing for their own account for resale. Commissions of 12½ per cent will continue to be paid to these dealers when selling for WAA.

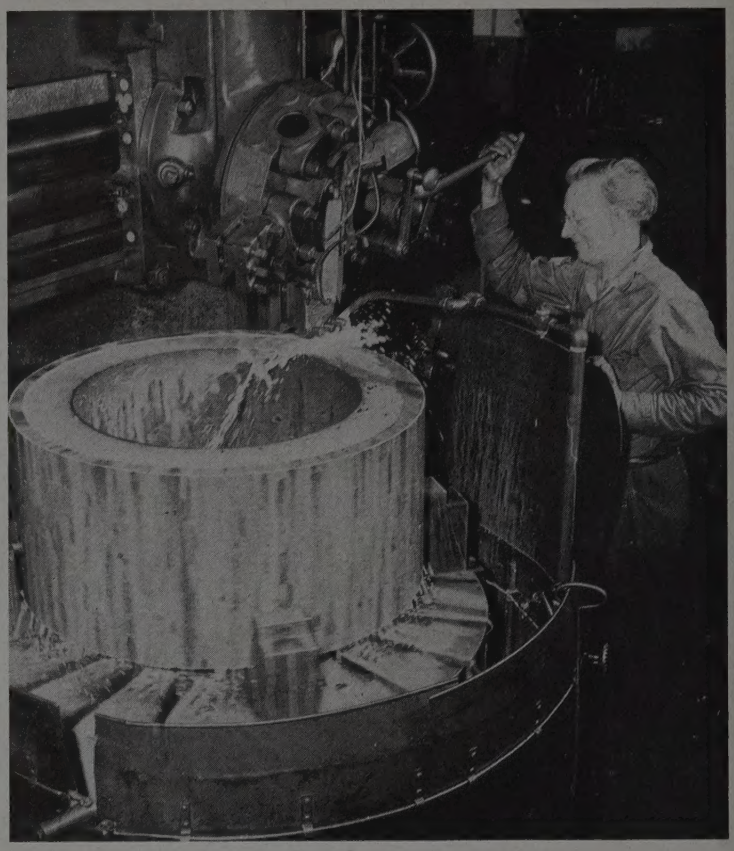
WAA told the committee that the Army-Navy Munitions Board has submitted a certified list of 65,000 machine tools for strategic reserve and replacement of obsolete and worn out tools in the various arsenals and ordnance plants. Lists are being prepared also for special and single purpose tools for the same purpose. The board, WAA said, has tentatively set up 30 teams to locate and inspect these tools in warehouses in the various WAA regional offices.

The committee unanimously recommended that all items of general industrial equipment which have fixed prices be included with the items to be sold by approved dealers on a commission basis.

Sales Boosted 300-500 Per Cent

WAA officials said that the sale of surplus machine tools under reduced fixed prices had increased 300 to 500 per cent in various regional offices. It was pointed out that the established retail fixed price was final and that there would be no further reductions in price on this type of surplus property.

A. A. Throckmorton, acting director of sales group 11, WAA, conducted the meeting. Members of the advisory committee are: R. Bierbaum, the Eastern Machinery Co., Cincinnati; A. G. Bryant, Cleereman Machine Tool Co., Chicago; A. B. Einig, general manager, the Motch & Merryweather Machinery Co., Cleveland; R. L. Giebel, Giebel Inc., 250 West 57th St., New York; H. H. Goldman, 9656 French Rd., Detroit; W. P. Kirk, Pratt & Whitney Division, Niles-Bement-Pond Co., West Hartford, Conn.; F. Reed, Niagara Machine & Tool Works, Buffalo; C. A. Simmons Sr., Simmons Machine Tool Corp., Albany, N. Y.; Tell Berna, general manager, National Machine Tool Builders Association, Cleveland; T. A. Fernley, American Machine Tool Distributors, 505 Arch St., Philadelphia; R. K. Vinson, Machinery Dealers National Association, 20 North Wacker Drive, Chicago; and O. E. Kiessling, Machinery & Allied Products Institute, Washington.



MACHINING 5100-POUND BEARING: A spherical roller bearing for use in the super-calender of the Kimberly-Clark paper mill in Niagara, Wis., is now being machined at SKF Industries Inc., Philadelphia. The bearing is 4 ft in diameter and weighs 5100 pounds

More Surplus Tools To Be Offered at Fixed Prices

The new fixed price policy has been so effective in stimulating sales of surplus machine tools that it will be applied immediately to many more tools which up to now have been sold under the Clayton formula. Effective Jan. 15, the War Assets Administration transferred machine tools of 247 additional models to its Fixed Price Register. That means, in brief, that they now are available at reductions of 25 to 40 per cent under the prices at which they were held under the Clayton formula.

The tools thus marked down on Jan. 15 are of 28 types, made by 58 different manufacturers. Included are boring machines, spur-gear grinders, external helical gear cutters, gear-tooth lappers, external and internal rotary-type gear-tooth shavers, semiautomatic cam grinders, spline and gear grinders, and various production and speed lathes.

Complaints that have been voiced by dealers in respect to current WAA policies are: The Defense Plant Corp. is not releasing equipment fast enough to WAA for disposal; and dealers are at a disadvantage in not being permitted to inspect equipment in WAA warehouses in advance of advertised dates of sales.

Restrictive Requirements Covered in New Forging Quality Steel Extras

Machine or torch cutting charges revised. Chemical composition specifications classified as nonstandard when they deviate from standards covered by AISI grade numbers and require extra charges

CERTAIN requirements for both standard and nonstandard grades of forging quality semifinished steel may be restricted in several ways, any one of which, when specified or implied, constitutes the classification of additional restrictive requirements. Each restricted requirement involves additional processing or testing; and the methods employed to meet such requirements are left to the discretion of the manufacturer.

All forging quality semifinished steel products are subject to permissible variations for check analysis, as well as method of sampling for check analysis, as provided by AISI.

The new size extra schedule for forging quality squares or rectangles of equivalent area is unchanged with but one size exception. For squares 4 x 4 to 6 x 6-in. exclusive, the new size extra is up $1 per gross ton to $3.

Machine or torch cutting extras are now established as follows: Lengths over 2 ft, $6 per gross ton; under 4 to 2 ft inclusive, $8; over 1 to 2 ft inclusive, $10; and for lengths 1 ft or less, by agreement, but not less than $20 per gross ton. No extra is charged for hot cutting (excluding torch cutting) for lengths 4 ft and over; under 4 ft the machine or torch cutting extras apply. Under the former cutting extra schedule, 48-in. and over was base; under 48 to 36 in. inclusive, $1; under 36 to 24 inclusive, $2; and under 24 in., $3.

Quality Extras Revised

Quality extras have been revised to include an additional restrictive requirements extra of $5 per gross ton; involving such factors as special surface, carburizing, homogeneity, special heat treating, restricted incidental elements. The above extra includes permissible restriction of one chemical element only. Extras for other restrictions such as restricted check analyses, restricted ladle chemical ranges or limits on two or more elements, special discard, or any other special restrictions not described or anticipated, are subject to negotiation between purchaser and producer.

A chemical composition specification is classified as nonstandard when it deviates from the composition of any one of the standard steels designated by a grade number by AISI. For a nonstandard steel specification an extra of $2 per gross ton is now charged. However, when a chemical composition is specified encompassing the chemical ranges of any one of the designated standard steel specifications with a greater range for one or more elements, the extra does not apply.

The maximum of the range for carbon, manganese, phosphorus and sulphur shall determine the chemical requirement extra. When the minimum limit only is specified, the maximum of the standard range applicable shall determine the extra. When the buyer specifies range greater than standard, the highest standard range within the greater permissible range shall determine the extra and govern the manufacture of the steel. In addition to revisions in base ranges for carbon and manganese chemical requirement extras, adjustments in other ranges also have been established. The chemical requirement extra for sulphur up to 0.07 per cent maximum inclusive, is $2; over 0.07 to 0.15 per cent inclusive, $3. When copper steel is specified, or for any specified minimum up to and including 0.20 per cent, the extra is $3 per gross ton.

Restricted chemical requirement extras have been revised as follows: For each 0.01 per cent reduction in standard range the carbon extra now is $1, against 50 cents; for narrowest acceptable restricted range up to 1.60 per cent maximum manganese the extra is $2, compared with $1 for reduction of not more than 1/5 of manufacturers' standard ranges up to 1.20 per cent minimum under the old schedule. For each .005 per cent, or fraction thereof, phosphorus reduction below standard maximum limits, for basic open hearth only, the extra is $1 and for sulphur $2. This compares with 50 cents and $1, respectively.

Numerous Changes Made in Extras On Hot-Rolled Carbon Plain Plates

NEW extra cards on hot-rolled carbon steel plain plates include a classification extra of 10 cents per 100 pounds for plates subject to ladle chemistry only and those subject to physical requirements (melt tests) only. For plates subject to ladle chemistry (carbon up to 0.30 per cent maximum inclusive and/or manganese up to 0.60 per cent maximum inclusive, phosphorus, sulphur) and physical requirements (melt tests) on qualities lower than flange, the classification extra is 20 cents.

Quantity extras are now set up on an item quantity in contrast to order quantity basis formerly. The new range of item quantity extras follow: Under 6000 lb to 4000 inclusive, 20 cents; 3999 to 2000 lb inclusive, 40; 1999 to 1000 inclusive, 50; and under 1000 lb, 75 cents.

The base for thickness extras formerly was 1/4-in. to 2 in. inclusive. This has been changed to 3/8 to 1-1/2-in. base. New extra for thickness under 3/8 to 1/4-in. inclusive is 15 cents; under 1/4 to 3/16-in. inclusive, 30 cents. A new schedule of extras has been established for killed and non-killed steel in thickness ranges of over 1-1/2 to 3 in., over 3 to 6, and over 6 in.

An individual plate weight extra of 50 cents also has been established for plates in excess of 15,000 lb theoretical weight when ordered in thickness under 1-1/2-in. in flange or firebox quality to specification A-285 or equivalent.

Width extras now apply for under or over 3/8-in., in contrast to previous pattern of under 1/4-in. and over 1/4-in.; otherwise essentially the same.

Former length extra base was 5 to 80 ft inclusive, now base is 8 to 60 ft, with general increases noted throughout the entire range. An extra of 30 cents is now charged within length range of 61 to 80 ft inclusive, which was formerly part of base range. Within length range of 81 to 90 inclusive the extra is now 35 cents; 91 to 100 ft inclusive, 40 cents. Under 1 ft the new length is $2, against $1.55; and extras for ranges 2 ft up to under 8 ft have been increased 5 to 10 cents.

Circular and sketch plate extras have been increased 10 per cent.

Plates over 1-1/2-in. thick are subject to flame cutting extras, in contrast to former practice of over 2 in. Flame cutting extras have been increased about 10 cents for thicknesses under 7 in., unchanged for over 7 in.

Heat treatment and surface finish extras have been revised in part as follows: Pickling advanced to 60 cents, oil-

ing to 20; while blast cleaning extra has been changed from per lb to sq ft of surface area basis. When annealing and normalizing or normalizing and stress relieving are specified, the extra is $1.25; spheroidize annealing, $1.50; quenching and drawing or tempering, $1.50.

Chemical requirement and restricted chemical requirement extras closely follow the revision established in the new hot-rolled carbon shape card; the maximum of the specified range shall determine the extra.

Quality extras include the newly established classification extras and have been increased accordingly. Specification extras have also been advanced and include classification extras.

The 5 cents per 100 lb extra for shipments protected from the weather now applies also when purchaser specifies material to be shipped in box cars.

New extras for bundling of plates have been established as follows:. One ton lifts, 10 cents; over 1 ton, 5 cents. For special marking of plates in addition to standard mill marking there is now an extra of 5 cents per 100 lb for up to and including 10 characters; 10 cents for more than 10 characters. No marking will be done on more than one side.

Name Floor Plate Specifications

Floor Plates: The tolerances for dimensions and workmanship permitted on orders for floor plates shall not be more restrictive than shown in AISI Steel Products manual, section 6, latest revision. Thickness is measured through the body of plate, exclusive of pattern. Shearing variations may be minimized by special shearing. When floor plates are specified with the greater dimension at right angles to the direction of the rolling, this dimension will be considered as the width, and extras figured accordingly.

Rectangular floor plates are considered base size when they are of standard pattern, not subject to chemical or physical tests or any specification requirements; 3/8-in. thick and heavier; 24-in. and over in width; 8 ft and over in length.

As in plain plates quantity extras now are on an item quantity basis.

Thickness extras have been revised as follows: 3/8-in. and over is now base, instead of 1/4-in. and over previously; range of thickness and applicable extras also revised.

Length extras have been increased with base now 8 ft and over instead of 5 ft and over formerly. Under 8 to 5 ft an extra of 10 cents is now charged, while under 5 to 2 ft inclusive the extras are up 5 cents; under 1 ft, up 45 cents.

When purchaser specifies other than

(*Please turn to Page* 144)

Recent Revisions in Extra Cards for Hot-Rolled Carbon Bars Clarified

Interpretations on questionable items issued by leading producers, covering both special and merchant quality bars, for benefit of consumers and district sales offices. Some points subject to negotiation between purchaser and producer

INTERPRETATION of some of the recent revisions in hot-rolled carbon bar extras, not only to customers but also for district representatives, has been found necessary by leading steel producers.

One large interest in a letter to district offices paraphased debatable features of the new extra card as follows:

Technically, steel quality as the term relates to bar products may be indicative of many conditions, such as the degree of internal soundness, relative uniformity of chemical composition or relative freedom from injurious surface imperfections. Steel quality also relates to general suitability for particular purposes or end uses. There are two fundamental quality classifications, namely, merchant bar quality, and special bar quality.

Hot-rolled carbon steel bars should be specified as special bar quality for purposes for which the merchant bar quality of bar steel would not be suitable or may be subject to requirements governing chemical composition, mechanical properties, workmanship, or finish more restrictive than would constitute merchant bar quality.

MERCHANT BAR QUALITY: This quality generally is used for structural and similar miscellaneous bar applications. Hot-rolled carbon steel bars of this quality are supplied in specified standard chemical grades or ranges to ladle analysis only or to standard mechanical properties. Steels of this quality are not furnished with a specified silicon content. This type of steel is usually rimmed, capped or semi-killed, at the producer's option. The steel is cast into molds without a hot top and the full product of each ingot is used after sufficient discard has been made to obtain freedom from injurious piping. The blooms or billets for subsequent rolling into hot-rolled bars of merchant bar quality are produced without surface conditioning, other then salvage conditioning.

Merchant bar quality bars are not subject to rejection for check analysis unless misapplication is clearly indicated.

Specified austenitic grain size is not acceptable for bars of this quality.

Merchant bar quality is not suitable for applications requiring special internal soundness, minimized occurrence of surface defects, or any of the other several special bar quality features. Merchant bar quality should not be specified when forging, heat treating, or other operations requiring restrictive steel producing practices are involved.

SPECIAL BAR QUALITY: This quality hot-rolled carbon steel bar should be specified for purposes for which the merchant bar quality is not suitable. Special quality bars are produced for applications involving forging, heat treating, cold drawing, turning, or other similar uses. Such applications require special manufacturing control for chemical composition, deoxidation, mold practice, pouring, discard, surface preparation, heating, rolling, cooling, testing and inspection. The quality classifications and special tests that are considered to be special bar quality as distinguished from merchant bar quality are described under this heading in the new extra card.

Hot-rolled carbon steel bars are produced under special quality classifications in specified standard grades or with permissible ranges or limits for ladle and check analysis.

Rimmed, capped, semi-killed or killed steels are produced in this quality dependent upon chemical compositions, manufacturing facilities and end uses. Sufficient discard is made to obtain freedom from injurious pipe and harmful segregation.

Blooms or billets for subsequent rolling into hot-rolled bars of this quality are carefully inspected and prepared by chipping, scarfing, grinding or other means to minimize surface defects.

When check analyses are made of any grade, the method of sampling for check analysis and the permissible variations are to be in accordance with the standards prescribed.

When required, austenitic grain size may be specified in killed steels as either coarse (grain size 1 to 5 inclusive) or fine (grain size 5 to 8 inclusive) to be determined in accordance with ASTM Specification E 19 of latest issue. Semi-killed, capped and rimmed steels cannot be produced to fine austenitic grain size (5 to 8 inclusive).

The testing method used for grain size determination will be at the option of

e producer unless otherwise specified. he steel is designated as coarse-grained hen the grain structure falls within the mits depicted in photographs 1 to 5 clusive, of the above-mentioned specication, and fine-grained when the grain ructure falls within photographs 5 to inclusive. The grain structure is to be nsidered satisfactory if 70 per cent the grains examined are within the ecified grain size limits due to the npossibility of examining specimens ross the corresponding sections of all e grains.

DDITIONAL RESTRICTIVE REUIREMENTS: In addition to the neral special quality features, certain strictive requirements over and above ecial bar quality may be specified, ch of which involves additional hand-ng, processing, testing or inspection, d is considered separately under the eading of "Additional Restrictive Reirements" in the new extra card. The ethods used to comply with these reictive requirements, whether they are pressed or implied in specifications, are be left to the discretion of the proicer. Additional special controls are cessary to meet more than one of these quirements on the same order and mulative restrictions may be conflicting prohibitive.

PECIAL COLD HEADING: Bars are oduced from special bar quality steel th surface control, special discard, ecial surface preparation, inspection, ting and selection for cold upsetting plications. Grades of steel with a ximum carbon of 0.30 per cent or er must be annealed if proper structure is to be obtained prior to cold upsetting.

SPECIAL SURFACE: When material is subject to inspection standards more restrictive than visual inspection standards, special surface must be specified.

Special surface bars are produced from special bar quality steel with exacting control in all manufacturing operations and surface preparation to minimize depth of seams and other surface defects. The extent to which these defects can be minimized is a matter of agreement between purchaser and producer.

SPECIAL CARBURIZING: Special carburizing bars are produced from special bar quality killed steel. This quality has controlled austenitic grain structure and is tested and selected for uniform carburizing.

SPECIAL DISCARD: Special discard refers to any specified definite or implied amount of ingot discard.

RESTRICTED LADLE ANALYSIS: Restricted ladle analysis limits may be specified for special bar quality steel as provided.

Cumulative restrictions on two or more chemical elements are subject to negotiation between purchaser and producer.

RESTRICTED CHECK ANALYSIS: For special bar quality steels, any deviation from the standard method of sampling constitutes a restriction. The interpretation of results is subject to agreement between the purchaser and producer.

RESTRICTED DECARBURIZATION: Decarburization limitations may be specified in special bar quality steels where maximum affected depth of surface decarburization is required for special applications. Decarburization requirements must be agreed upon between the purchaser and producer as special controls are needed in the producing plant.

HOMOGENEITY REQUIREMENTS (MACROSCOPIC): Carbon bars of special bar quality may be subjected to a deep etch test or fracture test when required by the purchaser. The etch test consists of deep etching a representative section in hot acid. The fracture test may be done by any recognized method. The location, number and interpretation of tests should be negotiated between the purchaser and producer.

NONMETALLIC INCLUSION REQUIREMENTS (MICROSCOPIC): When this requirement is specified in special bar quality steels, the samples for testing are taken on a longitudinal plane midway between center and surface of the material. The area of the sample to be examined should be agreed upon between the purchaser and producer, and should be hardened before being polished to avoid polishing pits. The rating of the inclusion count should also be agreed upon and be based upon a magnification of 100 diameters. Sulphurized steels are not subject to inclusion ratings.

SPECIAL HEAT TREATING REQUIREMENTS: When hot-rolled bars are specified for special heat-treating requirements all phases of heat treatment procedure and mechanical requirements are subject to agreement between the purchaser and producer, and must be obtainable in the full range of specified

(*Please turn to Page* 144)

NEW WATER HEATER PLANT: This new $3,500,000 plant of A. O. Smith Corp., Kankakee, Ill., is devoted exclusively to manufacture of automatic water heaters. Full capacity of 1000 heaters a day is expected to be reached in May after a few remaining operations are transferred from the company's Milwaukee plant. A feature of the new plant is the radiant heating system—a series of 120 small gas heating units mounted near the ceiling provide hot water for more than 300,000 feet of pipe, most of which is embedded in the floor

Windows of Washington

By E. C. KREUTZBERG — *Washington Editor, STEEL*

Republicans, with control of Congress, are finding trimming of budget and reducing taxes more difficult than campaign promises. Many believe cut in individual income levies will be not more than 10 per cent

THE REPUBLICAN majority is becoming accustomed to controlling Congress and is going through the usual motions, such as firing Democrats from the congressional payroll and replacing them with deserving individuals of the right political faith. Many familiar faces soon will be missing.

But the Republicans have found that in some particulars the going will be difficult. They stand committed to trim the President's budget of $37.5 billion down to around $32 billion—and that will not be easy. They now are confronted with the need for action on the campaign promise of at least some Republicans of a 20 per cent reduction in personal income taxes—and here again difficulties will be encountered. They also are confronted with the task of revising existing labor legislation, including a solution of the portal-to-portal pay issue—and the further they get into these matters the more difficult they appear.

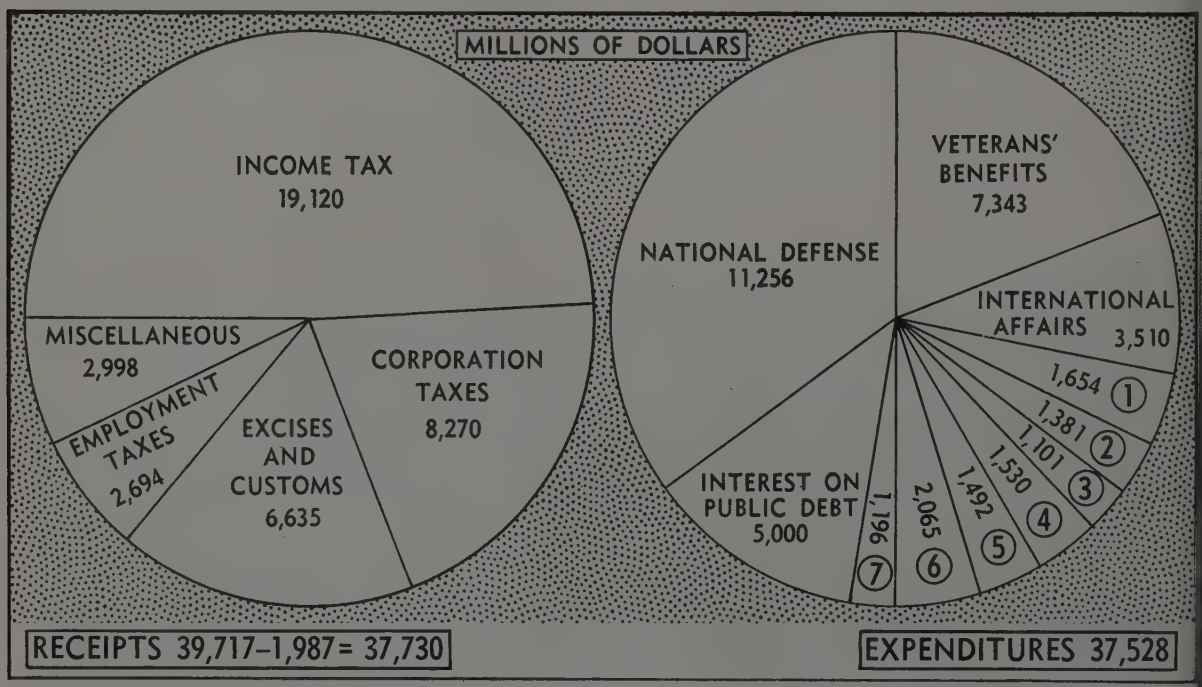
In preparing to get into these subjects, the Senate, for the first time in many years, has taken the initiative away from the House. Due to the fine preliminary work of the Senate Republican Steering Committee, which was headed by Sen. Robert A. Taft (Rep., O.), the main organizational work had been completed when the Senate convened. Many of the bills since introduced already had been written, and their provisions thoroughly discussed. As a result, indications are that the Senate committees will do most of the spade work in the first session of the 80th Congress, with the House undertaking to check and revise the bills as they emerge from the Senate.

As to taxes, Senator Taft's belated speech endorsing Rep. Harold Knutson's promise of a 20 per cent reduction in personal income taxes has in no sense cleared the air. Some of the old leaders go along with Mr. Knutson, but many of the younger, new members of Congress feel strongly opposed to the proposal for a tax reduction. In fact, it seems safe to say that the prevailing sentiment calls for a thorough look at the budget before tax action is taken. Many House members, including certain members of Mr. Knutson's Ways & Means Committee, feel that any reduction on individual taxes will not materialize before May or June, and they predict that the cut will not be greater than 10 per cent.

One of the little-publicized but highly significant actions is the organization, now in process, of a veterans' bloc in Congress. It is to consist of the 169 members of both houses who fought in World Wars I and II. The purpose is to "effectively sponsor legislation to aid our comrades." Speaker Joe Martin gave the veterans permission to use the House chamber for their organizing caucus.

Seek Views on Trade Program

The State Department has decided on an unusual method to "tap" American public opinion as to its foreign trade program. It will hold open hearings in six cities to get the public's reaction to



U.S. BUDGET: Above is a breakdown of the income and outgo for the federal government in the fiscal year 1947-48 as proposed in President Truman's budget message. The 1987 million subtracted from total receipts is appropriated to federal old age and survivors insurance fund. Numbered expenditures include: 1—Social security; 2—agriculture; 3—natural resources, including atomic research; 4—transportation and communication; 5—general government expense; 6—tax refunds; 7—housing, research, education, labor, finance, commerce, industry, reserve and miscellaneous and unclassified expenditures. Charts by NEA

NEW No. 150 HYDRAULIC INTERNAL GRINDER

large gears
large bushings
large bearings
large dies, etc.

Another Bryant Postwar Development for

The new No. 150 grinder is a great Bryant postwar achievement to vastly increase the internal grinding capacity of your plant. This big machine is easily controlled and produces the finest finish on gears, bushings, castings, etc., *up to 60" in diameter.* The many functional features of the new No. 150 assure extremely accurate work on a high production basis. The famous Bryant three point wheel slide suspension is basic and closely maintains wheel alignment at all times. A preloaded anti-friction cross-slide insures smooth hand and power cross feed, and a hydraulically retractable wheel slide simplifies the loading and unloading of parts. The work spindle is designed for the mounting of work fixtures on either end, and is hollow to facilitate the chucking of special spindles or long work.

In a single chucking, the new No. 150 can grind a bore, or a bore and face—the bore may be either straight or tapered. When grinding a face and straight bore the new No. 150 is particularly advantageous because it assures maintenance of squareness between bore and face. Outside diameters, or outside diameters and faces can also be finished in one chucking. A copy of the new catalog sheet giving full details is yours for the asking.

If you have internal grinding work in the range from 1/16 inch diameter bore to 60" diameter swing, Bryant has machines that will economically meet your requirements. It will pay you to—

Send for the man from Bryant.

BRYANT

BRYANT CHUCKING GRINDER CO.
SPRINGFIELD, VERMONT, U. S. A.

the government's present ideas as to the wording of the charter for the International Trade Organization to be formed under United Nations sponsorship in 1947.

In general, the State Department is seeking a lowering of world trade barriers, and a system under which the United States will give import concessions to foreign countries in exchange for favorable treatment on our exports.

Public hearings on the ILO program will open Feb. 25 in Washington. Simultaneous hearings will be held March 3 at Boston, Chicago and New Orleans, and March 10 at Denver and San Francisco. Proposals advanced by business and other spokesmen at these hearings will be considered by the State Department in preparing for the conferences with the foreign powers later this year.

In the meantime those desiring complete information on the present United States program for the ILO organization, as it was presented at a preparatory conference of 19 nations in London recently, can get it by writing to Clair Wilcox, director, Office of International Trade Policy, State Department, Washington 25.

Plan Meetings Abroad

Two meetings abroad now are on the State Department's agenda. The first is to be a further and final meeting of the preparatory committee of 19 nations to complete work on the charter this committee approved in preliminary form in London; the second meeting will be held in Geneva, Switzerland, starting April 8. At this Geneva meeting arrangements also will be made for the first ILO conference to be held in the fall of 1947. Present expectations are that some 60 nations will be represented at this latter conference and that it will be held somewhere in the Western Hemisphere.

The State Department says the ILO organizational plans will go forward even though Russia and her satellite countries continue to keep aloof. Department spokesmen point out that Russia in the prewar period accounted for only about 1½ per cent of the world's foreign trade, while that of the satellites accounted for 3½ per cent. Since the war the Russian bloc has shown comparatively little interest in doing business with the rest of the world. But the State Department hopes that the conferences with the Russians, tentatively scheduled to begin in March, will pave the way, first, for the negotiation of a trade agreement and a treaty of commerce, friendship and navigation with Russia and, second, for eventual Russian representation in the ILO.

The trade discussions with the Russians in Washington will be entirely informal without a set agenda. The conference will be wholly exploratory.

Denounce Escalator Clauses

Advisory Committee on Procurement Policy, the group charged with the responsibility of monitoring government purchasing methods, has roundly denounced the practice of placing contracts with escalator clauses. This method of purchasing has been used liberally by a number of agencies, particularly the Army and Navy, when it has been impossible to estimate costs with any degree of accuracy. It has made it possible to avoid red tape and get work under contracts started promptly.

Reason for the committee's objection to escalator clauses is that they force the government to assume "more than its due share of the uncertain price responsibility" in many cases. Also that such clauses make "exceedingly difficult or practically impossible the planning of a purchase program" which will "fulfill needs and yet stay within a carefully designed budget." The committee alluded to these clauses as "a remaining evil of contracting procedure born under the pressure of war" and admitted that clauses of this type "contributed valuably during occasions of emergency" but held that the time now has come to discourage use of this device.

Quite generally, said a committee spokesman, the use of an escalator clause springs from the hesitancy of a contractor in quoting a firm price because of uncertainty as to material, labor, transportation and other costs.

Study Arms Development Policy

To the Army Ordnance Department's arsenals should go the primary job of research and development in military materiel during time of peace so as to keep the "art" alive between wars. The arsenals should work on the development and improvement of equipment and processes for producing military materiel. They should also engage in manufacture of such materiel on a mass-production scale. After the arsenals have been provided with the contracts necessary to keep them busy on this assignment contracts should be spread to private manufacturers so that they also may retain the "know-how."

This general policy was proposed by the Small Arms & Small Arms Ammunition Committee of the Army Ordnance Association at a recent conference in the office of Maj. Gen. Everett S. Hughes, chief of ordnance. Purpose of the meeting, called at the request of Undersecretary of War Kenneth C. Royall, was to explore answers to the question of whether arsenal mass production should be maintained.

It was disclosed at the meeting that the arsenals as now set up can make small arms ammunition more cheaply than can the sporting arms manufacturers. The arsenals do not have the same rigid cost accounting, do not pay taxes, have a smaller turnover in personnel and a lower training expense; and the relatively small size of present ammunition requirements makes it impossible for commercial companies to compete on a break-even basis. At the same time, it was agreed that the main need is to keep the art alive—irrespective of cost angles.

Although General Hughes agreed with this position in general, he expressed the belief that it was up to the industrialists to solve the problems of mass production of small arms ammunition, including necessary speeding up of processes, discovery of suitable substitute materials, etc. Industry, he felt, should carry most of the burden on questions of this kind. He urged that the industrialists follow a policy of pressing the Ordnance Department for all pertinent information as it is uncovered so that they may fit it into their mass production plans.

Discuss Production Problems

An unusual proposal brought up at the meeting was that industrial laboratories and engineers be allowed to take a hand in the original development of future military items. Often when an item has been developed by the Army and handed over to industry to produce, the industrial experts find that design modifications are necessary in order to permit mass production, or to permit use of substitute materials. Such delays, General Hughes felt, could be minimized by calling in the manufacturers right from the start.

Committee members include: Chairman, C. K. Davis, president, Remington Arms Co.; deputy chairman, F. F. Hickey, Savage Arms Corp.; O. E. Hunt, General Motors Corp.; Thomas J. Watson, International Business Machines Co.; John M. Olin, Olin Industries Inc.; Graham H. Anthony, Colt's Patent Fire Arms Mfg. Co.; C. Donald Dallas, Revere Copper & Brass Inc.; Arthur G. Drefs, McQuay-Norris Mfg. Co.; Philip A. Wagoner, Underwood-Elliot-Fisher Co.; Ward M. Canaday, Willys-Overland Motors Inc.; L. A. Codd, executive vice president, Army Ordnance Association; Wallace L. Clay, Remington Arms Co., and C. Stewart Comeoux, Sporting Arms and Ammunition Manufacturers Institute.

hortage of Coal Places Severe landicap on British Industry

However, iron and steel industry, which has high priority, has not yet been affected seriously, although position of some works is none too secure. Fuel shortage is due largely to difficulties of transport. Government takes steps to ease crisis

BRITISH industry is faced with a ical situation owing to the acute rtage of coal now prevailing. Several tories, particularly in the Midlands l Lancashire, have had to close down porarily, having run out of fuel, while ers are operating on a hand-to-mouth is and using up their rapidly dwind- stocks of coal.

Thus far the iron and steel industry, which has a high priority, has not been seriously affected. However, the position of some works is none too secure; and some foundries are in great difficulties because of a lack of foundry coke. This position is not due so much to actual shortage of coal at the mines as to difficulties of transport, which have been aggravated by floods and fog. There is a shortage of engines and freight cars.

Emergency measures are being taken by the government to get over this critical period and a system of rationing and priorities is being applied to assure regular supplies to essential industries at the expense of the less essential and luxury industries.

BUSY AGAIN: Despite terrific damage wrought by American and British low-level bombing attacks in 1943 on the Ploesti oil fields in Rumania, this Ploesti oil refinery is now producing six million barrels of oil annually. The bubble tower, pictured above, receives oil by pipe lines from the oil fields 20 miles distant. Press Association Inc. photo

Belgian Exports Rise

Exports of iron and steel from Belgium and Luxemburg in October, 1946, reached the high point of 204,737 metric tons, corresponding to an annual rate of nearly 2,500,000 tons. October exports exceeded the exports of Great Britain for the same month.

Belgian production also showed an upward trend in October, the figures being: Pig iron, 222,630 tons; steel ingots and castings, 230,920 tons; and finished products, 193,480 tons. It is hardly likely that output can increase much further for some time because of the coal shortage.

It is likely that export prices may go up, especially for the open markets, which are offering premiums. Switzerland is in the market for semifinished steel; inquiries are also being received from Ireland and Finland. A number of commercial agreements are ripe for renewal with Denmark, Czechoslovakia, Yugoslavia, Norway, Portugal, Sweden, and new agreements are in the offing with such countries as Turkey and Syria.

France Rolls Prices Back

The Blum government has taken a novel and somewhat sweeping step in issuing a decree forcing down all prices, whether controlled or uncontrolled, by 5 per cent. It is expected that a further reduction of 5 per cent will be decreed in March.

The reduction applies to such items as customs dues and insurance premiums, as well as to all other current commodities. Effect of this move even if successful, will be mainly psychological and will not much affect the citizen's pocket, especially as at the end of December, 1946, it was decided, as part of the plan of economic recovery, to increase certain prices and rates by amounts ranging from 20 to 40 per cent. Steel products were likely to be increased by an average of 20 per cent, and they are the only commodity on which the decree applies a higher reduction than 5 per cent, namely 16.6 per cent.

Germany Short of Coke

It is reported that owing to shortage of coke, a substantial portion of steel is being made in electric furnaces. Most rolling mills and forges are idle.

Metallurgical Examinations, Analyses

Services of million dollar government laboratory available to law enforcement agencies. Examinations of evidence by Federal Bureau of Investigation technicians have aided in apprehension of criminals

THE SCIENCE of metallurgy has for many years been an efficient ally in the Federal Bureau of Investigation's scientific crime detection program.

Those familiar with metallurgy and the techniques and methods used in the examination of metals and analysis of their properties will be interested in seeing how this science has been utilized to advantage in FBI's laboratory.

Now in its fifteenth year and with an inventory estimated at more than $1 million, the laboratory is well equipped with scientific and precision instruments to offer all duly constituted law enforcement agencies scientific examination of evidence found at the scene of the crime or developed during the course of an investigation.

Daily, evidence of every type is forwarded to the laboratory by officials from all sections of the country. And daily, detailed reports on the findings of these examinations are sent from the laboratory to interested law enforcement agencies.

During the past year alone, the FBI laboratory conducted 67,229 examinations of evidence. Law enforcement organizations representing each of the 48 states and 2 territorial possessions were among the contributing agencies.

Metallurgical Examinations Made

Many of these examinations called for metallurgical examinations. Often the findings of this type of examination figured prominently in establishing the guilt of a suspect or the innocence of an accused individual.

Recently, several lengths of pipe, pipe caps, electric detonators, and leg wires used in electric detonating devices were submitted to the FBI laboratory. The case involved the bombing of an office of a furniture manufacturing company in a southern state, resulting in the death of an employee. Found in the demolished area were the remains of a booby trap which had contained three sticks of dynamite prepared with electric detonators and so arranged that at the time the electric furnace was plugged into the outlet, it would explode.

The victim unwittingly had acted according to the murderer's plans and on plugging the cord into the outlet had been immediately killed by the explosion.

To the FBI laboratory examiner was assigned the task of determining whether two unexploded pipe bombs also found in the room were similar to several lengths of pipe, pipe caps, detonators and leg wires obtained from the personal effects of a fellow employee of the dead man.

Metallurgical examinations corroborated the theory of the local police. The test pipes and the threads on the test pipes made by machinery available to the suspect were similar in every respect to those appearing on the bomb pipes. Likewise, holes drilled in the caps at the end of the pipe bombs were similiar to those which were made by either of the two bits found in the suspect's tool box.

Taken to trial, the suspect confessed his crime and was executed.

Spectrograph Valued Highly

With keen appreciation FBI laboratory experts handle the equipment utilized in conducting metallurgical examinations. To them, the spectrograph has proved its worth time and time again, particularly for its sensitivity and certainty. Equally important—its ability to offer unquestionable analysis of evidence too minute to be subjected to chemical examination.

Spectrographic analysis enabled a Pennsylvania police department to solve a local burglary. The telephone cord in the victim's home had been cut by the burglar. When the police searched a suspect, a pocketknife was found on his person. The knife together with the cut telephone cord were submitted to the FBI laboratory with the pertinent question, "Had the telephone cord been cut by the pocketknife?"

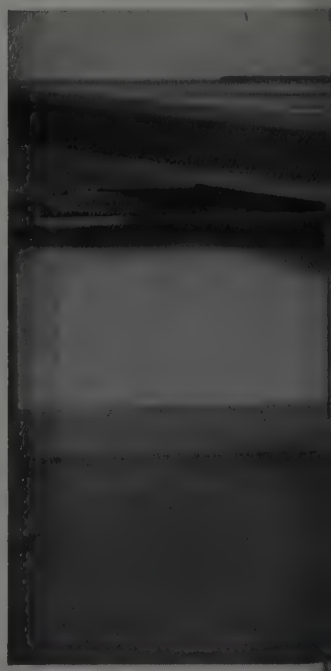
A laboratory examiner made a spectrographic analysis of the particles on the knife blade. Traces of copper and tin were found on the cutting edge of the blade, which traces appeared in the same proportions as the copper and tin making up the bronze alloy of the wire itself. In spite of the fact that these metals were not visible to the naked eye, their presence was established conclusively through the use of the spectrograph.

The finding of the laboratory expert resulted in conviction of the burglar.

During the wartime emergency, many types of metallurgical equipment were utilized by the FBI in its task of protecting the internal security of the nation. Among them the metallograph proved its indispensability through its accurate and definite analysis of the crystalline structure of the metal itself.

Defects in metal products were speedily detected through use of the Magnaflux. This equipment is now being satisfactorily utilized for peacetime crime detection purposes.

Also deserving honorable mention are the other instruments utilized in the FBI laboratory in connection with physical metallurgical examinations. They are: Electric muffle furnace with recording

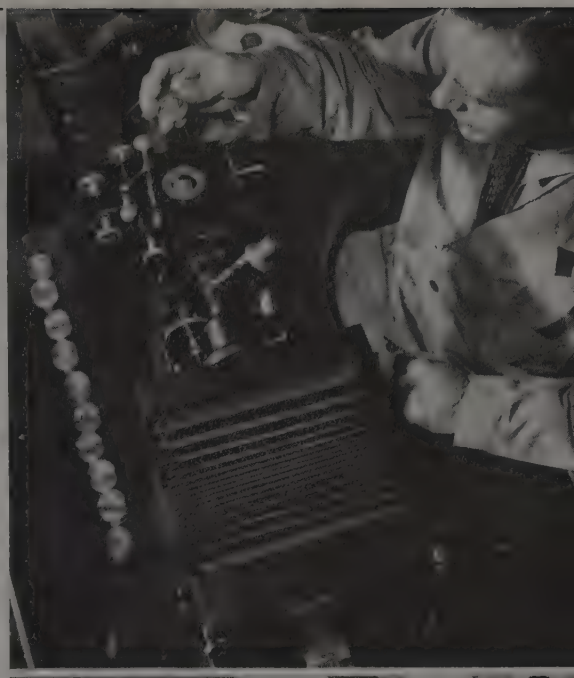


Aid FBI

By J. EDGAR HOOVER
Director, Federal Bureau of Investigation

temperature controlling units, metallaphic polishing equipment, hardness er, tensile tester, industrial x-ray, etc. n conjunction with spectrographic minations the FBI laboratory is ipped to conduct other examinations metals including the use of the high perature combustion furnace for demining carbon content. Analyses to ermine chemical composition are ered by gravimetric, volumetric, elecytic and colorimetric examinations.

Up to date statistics on the national ne situation clearly indicate that the eatened postwar crime wave is now actuality. However, the criminal, ether his calling be that of a murer, bank robber, extortioner or thief, daily discovering that present day ntific crime detection is spinning a proof web of evidence around him. e file he used to cut through the red windows of the grocery store; pair of gloves he wore when he e those copper ingots; the penknife used to slash the wire screen—each, pectively, when exposed to the metalgical examinations conducted by FBI boratory examiners, is "putting the ger" on him. The science of metallurgy definitely joined forces with law enement.

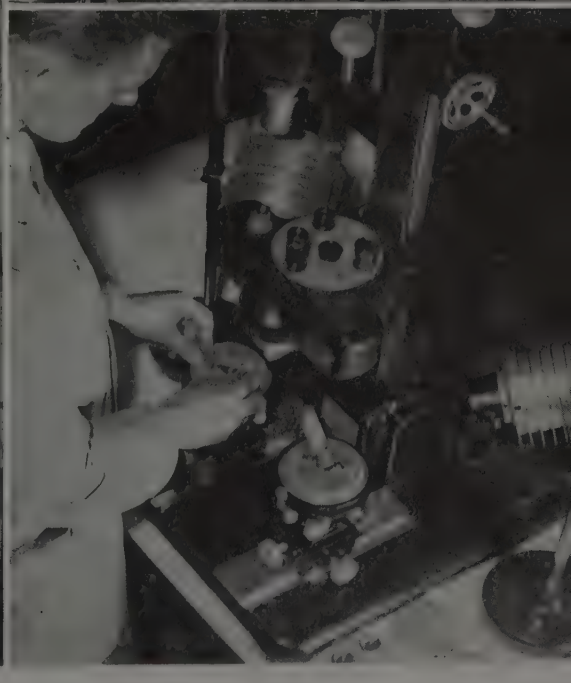


Federal Bureau of Investigation examiner examines the crystalline structure of mounted pieces of metal by means of a metallograph in the FBI laboratory, upper right

Examination of castings by means of the FBI laboratory's x-ray equipment, center right

Lower right, examiner makes a tool-mark examination of a damaged communications cable by means of a comparison microscope, to determine whether the chisel, left, was the instrument causing the damage

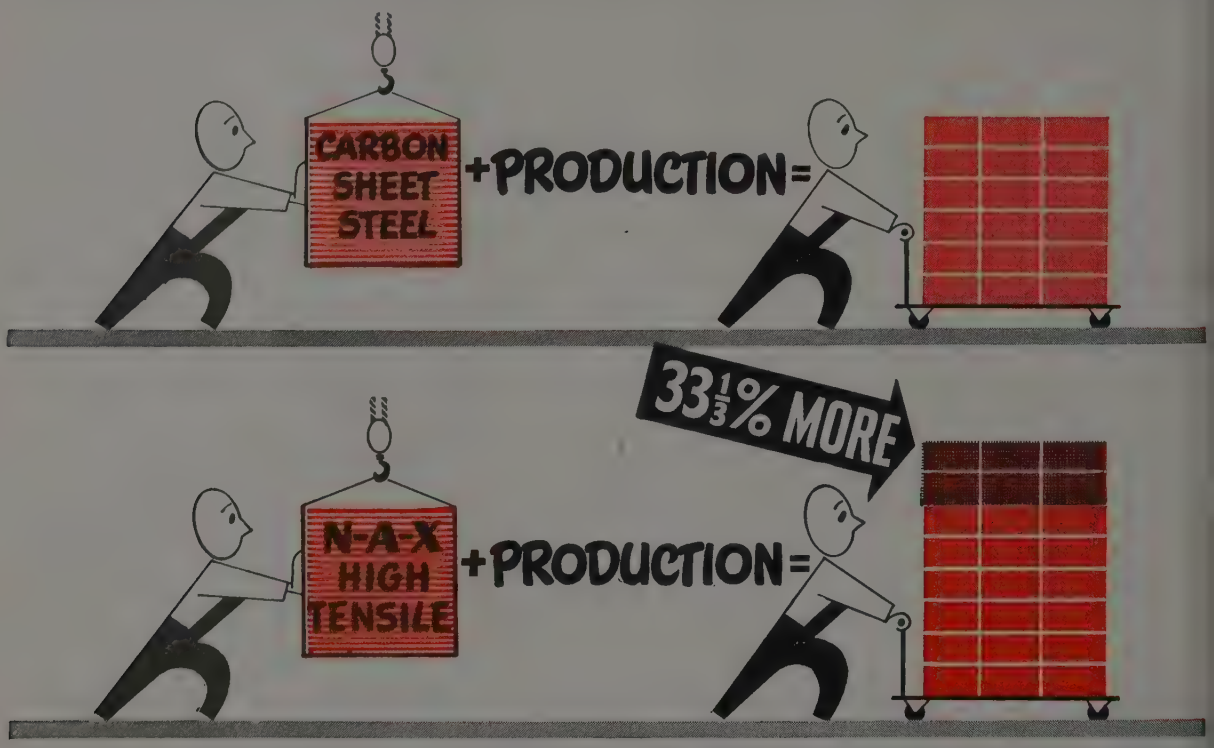
Lower left, an examination is being conducted on a grating spectrograph in the FBI laboratory



THE NEW ARITHMETIC IN STEEL

In production per ton—

1 ton N-A-X High-Tensile = 1⅓ tons Carbon Sheet Steel



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THE new arithmetic in steel is as simple, understandable—and as well worth remembering—as the multiplication tables.

N-A-X HIGH-TENSILE permits the use of lighter sections—as much as 25% lighter. Less steel is used per unit; more units are produced per ton. Yet finished products actually are stronger and more durable—thanks to the greater strength and toughness, the greater resistance to fatigue and corrosion, of N-A-X HIGH-TENSILE steel.

N-A-X HIGH-TENSILE also has excellent weldability, and can be cold-formed and deep-drawn to exceptional degrees for a high-strength steel.

The tremendous demand for N-A-X HIGH-TENSILE makes it impossible right now to promise normal delivery on new orders. However, our engineers will be glad to show you how to make the most of the new arithmetic in steel in figuring your plans for the future.

MAKE A TON OF SHEET STEEL GO FARTHER
Specify
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A. H. ALLEN *Detroit Editor, STEEL*

Mirrors of Motordom

Deliveries of steel to automakers likely to continue tight through first half. Projected increases in assembly rate in second quarter may be prevented by materials shortage. Effects of fall coal strike yet to be felt

DETROIT

THERE may be some who can sniff a ghtly easier supply situation in respect automotive steel, but they do not inde mill sales offices here which report ler books still jammed for regular tomers' requirements. Deliveries on -rolled sheet and strip are even worse n cold-rolled, and prospects are for an n tighter pinch around April 1 when larger auto producers are figuring to ost their assembly rates from the curt level; this is the date when some mates indicate the full effect of the ot loss during the recent coal strike l be felt in finished steel, and right v it looks doubtful that automobile edules can be lifted in the second arter.

Small bars, under 1-in., are just as bad sheet and strip on deliveries, although ger bars, forging billets and large nds are in better shape. Alloy steels in the best delivery position.

These days, district steel sales chiefs p pretty much in hiding. If they don't, y are promptly buttonholed by the sident of some motor company who nediately proceeds to cry all over them steel. This has led to some strange iations. Steel sales executives do not e short memories; they can remember arly how back as recently as 1938 ne of them were earnestly trying at st to get one foot in the door of omobile company purchasing departnts, particularly those of the smaller ependents, in the effort to book some nage. They received little beyond sty glances. Now the shoe is on the er foot, and mill representatives can haps be pardoned if they do not be- ne too exercised over the vociferous adings of would-be customers whose ghty aloofness of 1938 has changed to eetness and smiles in 1947.

A number of Ford suppliers are finding ir steel procurement problems partiarly tough. In years past they had reved their steel direct from the Ford l but they are now cut off from this rce because of in-plant demands from Rouge. So they must try to find tonge on the outside and, never having l a position of importance on mill oks, they discover it is now virtually ossible to establish such a position. sult is they must scurry around to a dozen or more sources in the effort to line up a little tonnage here, a little there.

Wartime changes in steel mill rolling equipment have also created problems for fabricators of automotive products. Take the case of long terne coils which, prior to the war, were used by several suppliers in substantial quantities. By using standard width coils they were able to expedite handling of steel stock to presses, and could slit the material to any desired width. During the war one large mill ripped out its facilities for producing long terne coils to make way for an electro-tin plating installation which, incidentally, is still not complete. There is only one other source for the terne coils and capacity is inadequate to meet demands. Result is that fabricators are forced to look around for substitute materials and methods.

Automobile Production

Passenger Cars and Trucks—U. S. and Canada

Estimates by Ward's Automotive Reports

	1946	1941
January	121,934	524,073
February	84,141	509,332
March	140,777	533,878
April	248,318	489,856
May	247,620	545,355
June	216,637	546,278
July	331,000	468,897
August	359,101	164,793
September	342,727	248,751
October	410,466	401,369
November	380,460	373,892
December	374,210*	302,518
Total, 12 mos.	3,257,391*	5,108,992

Estimates for week ended:

	1946	1941
Dec. 28	67,070	25,620
	1947	1946
Jan. 4	53,437	13,920
Jan. 11	78,329	23,340
Jan. 18	90,000	28,485

* *Preliminary.*

Automakers Study Steel Rise

The sharp increase in steel prices still has not had time to be fully digested, and its ultimate effect on overall materials costs for automobile manufacturers cannot be determined accurately. That it will be substantial is for sure. Not only have base prices been lifted, but scores of extras likewise have been boosted, some as much as five times the former figure, and new extras added, such as those for special packaging and loading. If the average automobile requires two tons of steel, gross, in its manufacture, it would appear higher prices will mean an added cost of $25 at least, probably more.

Independents Fare Best

The question has been asked why some of the independent automobile builders were able to manufacture more cars in 1946 than in 1941, when the larger companies could not obtain sufficient material to do better than one-half or two-thirds of their 1941 volume. One answer may be that the independents, Nash and Hudson to name two, made a faster start on production late in 1945 and consumed their 1946 steel allotments right up to the hilt, while the larger units had a little backlog of material. This would not explain how the independents managed to obtain more steel in 1946 than in 1941, the probability being that steel companies have been more lenient with smaller users as far as allocations were concerned and that the automobile companies were able to obtain some tonnage from mills never serving them previously.

At any rate, the independents are hard pressed for steel right now, and they are pouring on all kinds of pressure to step up shipments. Nash has been forced to make a 25 per cent reduction in schedules this week because of steel shortage, and will be forced to continue under reduced draft for a month anyway. Assemblies have been running 500-600 daily. Similarly, Hudson has repeatedly had to suspend operations for a day or two because of shortages of sheet steel.

Chevrolet in Front

Chevrolet output for 1946 totaled 397,108 passenger cars and 270,137 trucks, establishing the division in the No. 1 slot in the industry, despite complete lack of production in the first quarter. December volume alone totaled 96,695 which is at an annual rate of better than a million, but the year's aggregate was less than half the 1941 level. Production potential this year will be reinforced with the completion of two new assembly plants, in Flint, Mich., and Van Nuys, Calif.

March 13 is the date for an official decision on whether the Chevrolet light car project will be resumed. Equipment

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ON-THE-SPOT TESTS: Mobile laboratory equipped with portable spectroscope and other equipment enable Ford Motor Co. to make on-the-spot tests daily at its Rouge plant. The new unit is used daily for rapid semi-quantitative analysis of incoming carloads of steel scrap and kindred operations in which time is of the essence. Mounted on a Ford panel delivery truck, the equipment includes spectroscope, chemical spot testing and color carbon test equipment, portable grinder for spark testing, and a gasoline-driven generator as a source of power

suppliers who have been holding orders in abeyance since suspension of the activity last summer believe chances are 10 to 1 the program will be reactivated, in view of the improved materials outlook for the second half of this year and for next year, the likelihood of no major work stoppages by union labor and the widespread complaints over high car prices.

An engineering group concentrating on the design of this entirely new light car was not disbanded last year and continues at work. Further support to this viewpoint is given by the statement from Ford sales manager J. R. Davis in Boston recently to the effect his company would offer in 1948 a radically new low-priced car marking the cleanest break from Ford tradition since the introduction of the model A. Ford, of course, announced abandonment of its low-price car project about the same time as Chevrolet, and is very sensitive competitively to any change in Chevrolet policy.

Originally it was the Ford plan to strip the new model of all accessories and gadgets in the effort to get the price down under $1000, but a subsequent survey disclosed the public did not want to sacrifice features it had been accustomed to, at any price, nor did it want a car so light as to lack riding comfort and roadability. Just where this leaves the light car, the low-price car or whatever you want to call it, is anybody's guess. Some engineers feel it is entirely possible to work out a design which will knock out about 1000 pounds of dead weight from today's average and still have roadability and comfort. As yet no one has done it, and to accomplish such a design successfully it will be necessary to throw out former concepts completely and start from four wheels to develop a 100 per cent new vehicle—exactly what Chevrolet is now undertaking, incidentally.

Start 1947 Model Assemblies

Pontiac and Oldsmobile started 1947 model assemblies last week and should rapidly move to the 1000 per day level. This year's styling is more notable for what has been left off than for what has been added, as far as decorative trim is concerned. Actually, it takes a practiced automotive eye to discern the differences from the 1946 models.

Olds, incidentally, built 119,328 cars in the past model year, a couple thousand of them in 1945. About 80 per cent of them were equipped with the hydramatic transmission, as optional equipment. Pontiac assembled 137,640 in the model year, maintaining approximately the same proportion of 1941 output as other GM divisions. Hot and cold-rolled strip steel continue to be the most critical materials at Pontiac, although a controlling factor in the supply of 1947 models may prove to be cast iron. An expansion program at the Pontiac foundry is lagging, new cupola installations being held up for lack of starters on blower motors, to name one stumbling block.

Designs Complicate Procurement

Engineers laying out elaborate new designs for 1948 models are prone to give too little consideration to available materials. For example, one proposed model, in the large volume field, would have required cold-rolled sheets 90 inches wide, not the easiest commodity in the world to obtain and one which might easily prove to be a serious production bottleneck. If engineers kept posted on the supply situation in respect to various materials they are proposing to use they might save themselves considerable work in laying out schemes which are licked before they reach the purchasing department.

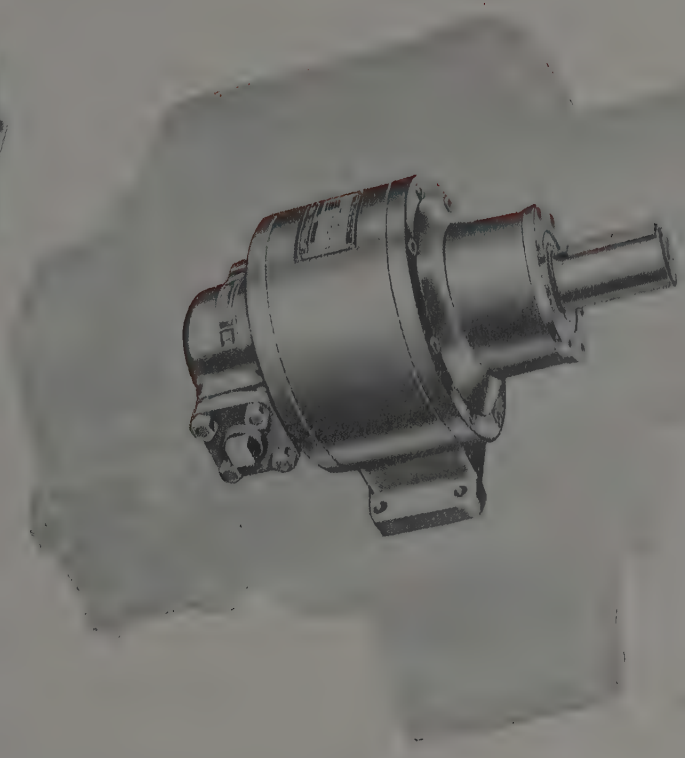
Willys Sets 15-Year Record

Willys-Overland produced more vehicles in 1946 than in any 12-month peacetime period in the past 15 years—71,455 universal jeeps and 6533 jeep station wagons—in spite of a 40 per cent production curtailment resulting from materials shortages. The company has set sights on a goal of 161,803 units for this year and 300,000 for 1948. Included will be present vehicles, plus a line of two and four-wheel drive trucks powered by jeep engines, and a new 6-cylinder passenger car which will not be ready much before the end of this year.

J. D. Mooney, Willys president, told Chicago advertising executives last week that car prices might go up still further if steps are not taken to reduce the national debt and accordingly to stop devaluing the currency. On the score of production efficiency he noted that, on the basis of the 40-hour week, plants work an average of 20 eight-hour days a month, or a total of 160 hours out of a possible 720 in the 30-day month, resulting in production for only 22 per cent of the time available. This figure is further reduced to around 15 per cent if production inefficiency is figured at one-third.

Mooney concluded his remarks by deploring the overemphasis placed on sex in current advertising. He said: "The trend toward sex really was started many centuries ago by Adam and Eve, but advertising men rediscovered it a few years ago with the result that we now find sex in advertising at an all-time high." He urged advertisers to exert their influence to get people back to work to cut costs of production and distribution.

unior does a Man-Size Job!



HYDRAULIC BALANCE FOR LIFE

HYDRAULIC BALANCE FOR LIFE

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As its name implies, Superdraulic Junior is practically a duplicate n a reduced scale) of the famous Superdraulic 40 Horsepower onstant Delivery Pump. It delivers 5000 psi in continuous duty ervice, with volumes of 3 gpm at 1800 rpm, or 2 gpm at 1200 rpm. olumetric efficiency averages 95% with the lightest hydraulic oils. adial multi-plunger design insures smooth delivery. Perfect hydraulic alance insures thousands of hours of trouble-free service. Super- raulic Junior can also be used as a powerful reversible hydraulic otor.

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- ☐ Up to 5000 pounds per square inch pressure for continuous duty service.
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- ☐ *Perfect* hydraulic balance. Thousands of hours of trouble-free service.
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- ☐ Radial multi-plunger design. Smooth delivery.
- ☐ Efficient performance as a powerful reversible hydraulic motor.
- ☐ Quantity production prices.

Complete information upon request. Just check ☒ your requirements.

RAULIC BALANCE FOR LIFE HYDRAULIC BALANCE FOR LIFE

Standard Control Division Set Up By Westinghouse

Several activities formerly at East Pittsburgh consolidated. Division will operate Beaver, Pa., plant

CREATION of a Standard Control Division to operate Westinghouse Electric Corp.'s Beaver, Pa., plant has been announced by T. I. Phillips, vice president of the corporation. The new division, which represents consolidation of several activities now being carried on at East Pittsburgh, Pa., will be under the direction of J. B. MacNeill, manager of switchgear and control, and was set up as part of a $31 million expansion program under way in the East Pittsburgh divisions.

Establishment of the new division at the Beaver plant, which will manufacture devices to regulate the speed of electric motors and to protect electrical circuits, makes more space available for the Transportation & Generator and Switchgear & Feeder divisions of the company, Mr. Phillips said. The additional space freed by this change and by others to be made later will enable the divisions to increase their capacities by from 30 to 40 per cent, Mr. Phillips predicted.

Manager of the new division, as announced by Mr. MacNeill, will be J. A. Butts, who has been manager of the Small Device Circuit Breaker Department of the company.

Jet Development Stressed In G-E Expansion Program

Expansion plans of General Electric Co.'s Aircraft Gas Turbine Division at Schenectady, N. Y., were recently announced by division officials. Included in the program is construction of a new laboratory and increased production facilities for aircraft jet engines of advanced design.

A one-story structure, containing 25,000 sq ft of floor space with a series of chambers to test jet engines during various manufacturing stages, is already under construction at the G-E River Works, company officials stated. Costing approximately $500,000, the test-cell project is expected to begin operations in the near future.

The remaining phases of the expansion program for production of proposed new and more powerful jet engines will be continued over a two-year period.

International Nickel To Distribute Teaching Aids

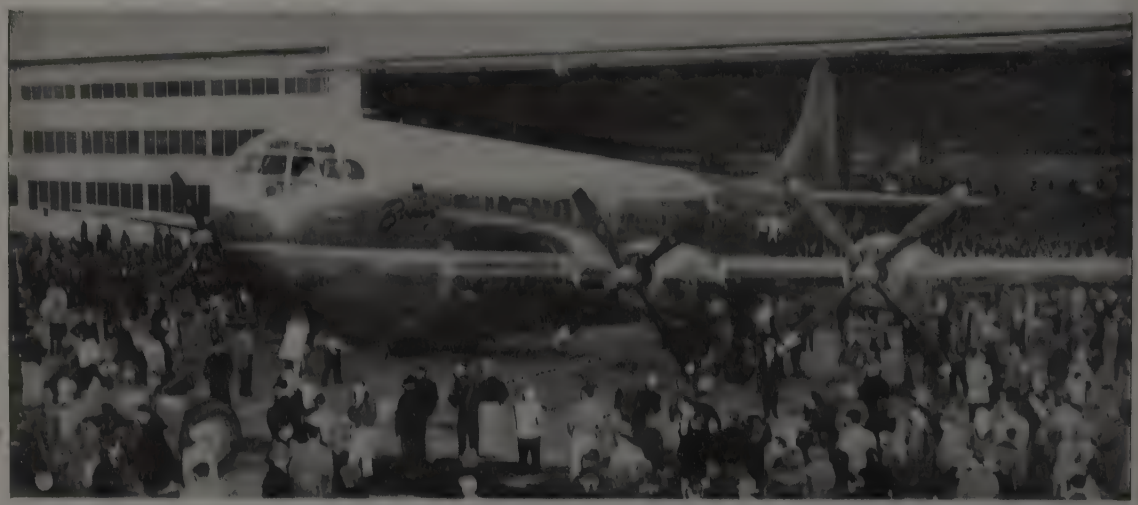
A program to advance engineering education through the distribution of technical literature and training aids has been announced by T. H. Wickenden, manager, Development & Research Division, International Nickel Co. Inc., New York. Material of use in classroom instruction in engineering courses is being offered by the company to several of the largest engineering schools at the present time, and as rapidly as possible it will be made available to all technical institutions.

Each institution will be furnished an exhibit containing approximately 50 samples of nickel-containing materials, a portable metals identification kit containing about 35 specimens of metals and alloys for qualitative identification, literature and other technical and practical information concerning nickel and its alloys. Motion pictures of the company's mining, smelting and refining operations will also be made available.

Malleable Founders Group Announces Honorary Award

Establishment of an honorary award known as the Charles H. McCrea Medal, to be given annually to the individual rendering the most meritorious service to the malleable iron industry, has been announced by the Malleable Founders Society, Cleveland.

The medal has been presented to the society by National Malleable & Steel Castings Co., Cleveland, in memory of its late president who was also a director of the Malleable Founders Society from 1939 until his death in 1946. The recipient will be chosen each year by a committee of five members of the society and presentation will be made at the annual meeting in June.



YC-97 COMPLETED: With only a few inches clearance between its tail and the top of doors, the first Boeing YC-97 is rolled from the Seattle plant. Note special ramp on which nose wheels traveled, a procedure necessary to "duck" the tail under the doors. The tail of the plane is slightly more than 33 feet high

BRIEFS . . .

Paragraph mentions of developments of interest and significance within the metalworking industry

McKiernan-Terry Corp., Harrison, J., has acquired key personnel and ets of Mead Morrison Division, Rob- Conveyors Inc., Passaic, N. J. The bins company is and remains a subsid- y of Hewitt-Robins Inc., Buffalo. The w combination will co-operate on har- r facility projects involving bulk ma- ials handling equipment problems.

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Wilkof Steel & Supply Co., Canton, has been awarded the Fleck plant, eveland, formerly owned by Taylor- aft Aviation Corp., Alliance, O. Sold $200,000, the plant is equipped with avy industrial machinery and welding ls.

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Milwaukee Stamping Co., Milwaukee, s bought Precision Metal Workers, icago, stamping firm. Precision, which cupies a plant with a floor area of 62, 0 sq ft, becomes a division of the Mil- aukee company, but its personnel and oducts are unchanged.

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Columbus-McKinnon Chain Corp., nawanda, N. Y., has sent two of its ecutives, Franz T. Stone and John H. odwin Jr., to Johannesburg, South rica, to visit company operations there.

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Bucyrus-Erie Co., Milwaukee, has de- gned and built what is said to be the rld's largest capacity tin dredge. Re- ntly launched in Tampa, Fla., the dge was built for Billiton Co., The gue, Holland, and will be used to in- ase tin production in the Dutch East dies.

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Acme Broach Corp., Lexington, Ky., s completed a new plant for production broaching tools. A second building jacent to the first is now under con- uction, and plans for a third are be- g considered.

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Pennsylvania Engineering Works, New stle, Pa., builder of blast furnace and el mill equipment, has been merged o Pennsylvania Engineering Corp. Per- nnel and business conducted by the for- r company remain unchanged.

—o—

Farnham Mfg. Co., Buffalo, announces quisition of personnel and assets of ragon Research Inc., Buffalo, by mer- r. By enlarging its research and engi- ering departments, Farnham plans in- creased activity in metal fabricating fields.

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Ajax Iron Works, Corry, Pa., has start ed production of gas engines in addition to its regular line of heavy duty steam drilling engines.

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Kelly Reamer Co., Cleveland, an nounces territory enlargement for its sales and engineering representative, A. R. Shevlin Co., Boston, now to include Rhode Island and Massachusetts east of and including Worcester County.

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Hexacon Electric Co., Roselle Park, N. J., has built an addition of 7000 sq ft to its plant.

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A. O. Smith Corp., Milwaukee, has moved its Water Heater Division to a new $3,500,000 plant at Kankakee, Ill.

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Cleveland Tapping Machine Co., Hartville, O., has reaffirmed Wallace Machine Tool Co., New York, as its representative for southern New York state, including Long Island, and north ern New Jersey.

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Acme Aluminum Alloys Inc., Dayton, O., has established an eastern sales divi sion with headquarters in Commercial Trust Bldg., South Philadelphia, Pa. James E. Kendig heads the new sales of- fice which will handle Acme's aluminum alloy castings, tools and dies for the east ern states from Maine to North Caro lina.

—o—

Menasco Mfg. Co., Burbank, Calif., has signed a $3,838,000 order with Glenn L. Martin Co., Baltimore, to supply them with landing gear for the 2-0-2 and 3-0-3 passenger and cargo planes and for the XB-48, a 6-engine jet bomber being built for the Army.

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Beryllium Corp., Reading, Pa., has dis- solved and taken over all assets and lia- bilities of its totally owned subsidiary, Beryllium Corp. of Pennsylvania.

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Twin Coach Co., Kent, O., delivered during December 120 urban type coaches, a 20 per cent increase over No- vember.

—o—

Sales Counselors Inc., Detroit, has re cently formed to aid businesses in their sales development and public relations programs. Principals in the firm are C. P. Fisken, former advertising manager and sales executive, Chevrolet Motors Division, and Robert L. Perry, former *Detroit Free Press* business editor.

—o—

Office of Technical Services, Depart- ment of Commerce, Washington, has put on sale a report on selection of materials for aircraft control cables and on treat ments for preventing corrosion and fa- tigue failure of such equipment. These cables are used in the control of ailerons, rudders, elevators and other aircraft parts.

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American Agile Corp., Cleveland, manufacturer of welding equipment, an nounces appointment of Monroe Sales Corp., Philadelphia, as exclusive sales representative for eastern Pennsylvania, southern New Jersey, Maryland and Del aware.

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Lodge & Shipley Co., Special Products Div., Cincinnati, announces expansion of its line of air eliminator valves with a valve for industry use applicable to all steam processing.

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Aro Equipment Corp., Bryan, O., an nounces appointment of the following jobbers to handle its line of industrial air tools: Grayson-List & Co., Jersey City, N. J.; Erie Mfg. & Supply Co., Erie, Pa.; Bay State Supply Co., Cincin nati; Wilkinson-Kompass Ltd., Hamilton, Ont., Canada; and Welders Supply Co., Toronto, Ont., Canada.

—o—

Kromex Corp., Cleveland, manufac turer of household wares, has purchased from WAA a 4-story building at 860 E. 72nd St., Cleveland, for about $275,000. Occupying 165,000 sq ft of floor space with railroad siding included, the fac tory was formerly part of the Cleveland Graphite Bronze Co.'s war plant.

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Hotpoint, Inc., Chicago, General Electric affiliate, this year will market a new washing machine that soaks, washes, rinses and rinse-dries clothes with only one dial setting.

—o—

Rust Engineering Co., Pittsburgh, com pleted design and construction of indus trial plants and facili ties valued at more than $50 million during 1946.

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Ladish Drop Forge Co., Milwaukee, has shortened its name to Ladish Co.

—o—

Belle City Malleable Iron Co. and Ra cine Steel Castings Co., Racine, Wis., re cently held an open house for families of employees and the people of Racine.

Report Foresees More Growth in West's Industry

Expansion is expected to include advance in California's steel and steel-consuming industries

SAN FRANCISCO

AN EXHAUSTIVE survey of present and future prospects for the steel and steel-consuming industries in California has just been completed for the State Reconstruction & Re-employment Commission.

The report points out that during the war California expanded its manufacturing facilities to a much greater extent than the remainder of the U. S. This expansion occurred largely in durable goods fields, and an important proportion of the war-built facilities now are being converted for peacetime manufacturing purposes.

The report specifically shows that a tremendous expansion of the steel industry took place during the war, but in order to use some of these plants for peacetime purposes many facilities will require alteration.

However, the report concludes, California's steel and steel-consuming industries will enjoy a substantial long-term advance, at least to the same extent as manufacturing in general.

Many Evidences of Growth

Although specialized war industries, such as aircraft and shipbuilding, have been cut back heavily, the report says, there are many current evidences of expansion and growth in the state's steel and steel-consuming industries. In this connection, railroads and other public utilities report an unprecedented number of requests for information about possible sites and other facilities available for both new industries and plant expansions in California.

The degree to which manufacturing in general and the steel-consuming industries in particular may be expected to expand in California will, to a large degree, be determined by special investigations of the locational advantages and handicaps for each type of manufactured product, the report declares.

One of the greatest locational advantages of California has resulted from the rapid increase in the western market as a result of the wartime expansion in population and industry.

On the other hand, one of the greatest western industrial handicaps arises from the fact the eastern part of the country already has established large-scale production on an economical basis. Where economies in production of certain products are markedly greater in favor of the East, production of those items probably will continue most heavily in the eastern sections of the country.

However, in some instances, the report says the western market is now, or soon will be, large enough to support assembly line operations or essential tool and die equipment. It is pointed out that large increases may be expected in the assembly of automobiles and the manufacture of automotive parts, refrigerators and food-products machinery. Increases also are expected in the manufacture of tin cans and other tinware, stoves, water heaters, electrical appliances, tractors, agricultural machinery, pumping equipment and air compressors.

Another factor favoring growth of industry in the West is the exceptional interest being shown by national manufacturers in establishing branch plants in California. Pacific Coast buying offices of national distributors also are active in developing regional resources. As a result, construction activities of the West are expected to remain at high levels for a number of years.

The commission's report comes to the conclusion that, in broad terms, three types of industrial situations now present the greatest possibilities for regional development. They are:

1. Industries making products with unique local and regional markets, which in some instances can also be sold in other areas in national competition.

2. Industries in which regional freight costs and other advantages allow regional competition but do not provide sufficient advantages for national competition.

3. Industries so highly dominated by national firms that regional production can occur primarily only through branch plants of these firms.

The report points out that many small consumers of steel will have an unprecedented opportunity to establish themselves or improve their market positions; however, some will be handicapped in marketing, the study believes. In this connection, the report says:

"The state of California with the federal government and private interests can make a constructive contribution toward maximizing production and employment by assisting these smaller enterprises in overcoming their most serious handicaps within the bounds of sound, economical operation."

In analyzing the broad field of the steel industry, the full report discusses the industrial development of California and the 11 western states as a unit.

Starts Mass Production Of Gasoline Engines

LOS ANGELES

McCulloch Motors Corp. is beginning mass production of gasoline engines in a new plant adjacent to the Los Angeles airport. The company was originally established in Milwaukee as Mc-

Crankshafts are finished almost entirely by grinding operations in the plant of McCulloch Motors Corp., Los Angeles. When the plant reaches capacity, crankshafts will be moved from one machine to the next on conveyor tables

ulloch Aviation Inc., and began its ove to the West Coast in January, 946.

The new plant, which cost approxiately $1,600,000 to build and equip, s a capacity of more than an engine minute. Production scheduled for Janry is 4300 engines, with increases anned during successive months until e capacity of one engine a minute is ached. At that time, employment is pected to be about 1000 workers.

The first engines to be produced in lume are the Series 1200, of which ere are at present four models, rang- from 2½ to 4-hp. All major parts these engines are high-pressure, aluinum alloy die-castings, with the exptions of rods, crankshafts, and cylder sleeves. Series 1200 engines are 2-cycle, air-cooled type.

Also in production, but in lesser quanes, are the Series 4300. These are posed-type, 2-cycle engines designed develop extremely high horsepower r pound for use in target aircraft.

Development and experimental proams on other types of engines up to 3 hp, for use in the automotive, aviaı, marine, and other industries, is be- carried on concurrently with the oduction of standard models.

AM President Says Price rend Is Now Downward

LOS ANGELES

Earl Bunting, president of the Nation- Association of Manufacturers, said in s Angeles last week that "prices have rted down and the trend will conue unless outside influences force instry to raise them against its will. The e obect of modern industrial developnt is to produce more and more goods lower and lower prices.

"Unfortunately, labor leaders to date ve shown little inclination to follow patriotic course suggested by the sident. They have indulged in attacks the national economy such as the tal-to-portal suits and the false claims the CIO that wages can be increased much as 25 per cent without raising ces."

Mr. Bunting expressed the opinion that contributions of the new Congress uld take the following form:

Restoration of equality before the law taking legal protection away from nopolies now enjoyed by labor unions.

Reduction of government expenses and es with a balanced budget and a start debt retirement.

An entirely new set of laws affecting or-industry disputes, with the Case as a starting point.

Freight Rate Reductions on Steel Shipments from Geneva Approved

Schedules authorized by Association of Western Railroads provide for reduction to $9.60 a ton on steel moving to San Francisco, Los Angeles, Portland, Oreg., and intermediary points, and $10.80 on shipments to Seattle

SAN FRANCISCO

THE long-awaited reduction in freight rates on shipments of steel from Geneva, Utah, to the West Coast has been authorized by the Association of Western Railroads.

The new schedules provide for a reduction to $9.60 a ton on steel moving to San Francisco, Los Angeles, Portland, Oreg., and intermediary points and $10.80 a ton on shipments to Seattle. The previous commercial rate on shipments to San Francisco, Portland and Los Angeles was $12.20 a ton, although during the war a special rate of $9 was in effect when Geneva's output of plates was moving to government shipyards on the coast. The new Seattle rate of $10.80 compares with a previous rate of $14.

In effect, the new rates are those requested by Geneva Steel Co. The firm had asked for a rate of $8 a ton several months ago, but meantime the Interstate Commerce Commission granted general rate increases of 20 per cent to the railroads. The new rate of $9.60 thus is the $8 rate plus the 20 per cent increase. The rates apply only on carloads of 80,000 pounds or more.

The railroads granting the cut in rates are the Union Pacific, Great Northern, Denver & Rio Grande and the Western Pacific. The rates, which are being filed with the Interstate Commerce Commission, will become effective 30 days after the filing unless suspended by order of the commission.

It is not known whether protests against the rates are being planned by competing steel companies. During the original hearings on the rates last summer, opposition to the reduction was small compared with the large number of firms and organizations favoring the reduction in rates.

Effects of the new rates are expected to be far-reaching. West Coast fabricators will be aided by cheaper steel, and thus will be able to compete more favorably on finished products with goods made in the eastern part of the country.

The reduction in rates also had been considered an important key to Geneva's future. If rates had remained at a high level, the Utah produced steel would have been at a competitive disadvantage with steel shipped by water from the East Coast at shipping rates equal to or lower than the rail rate from Geneva to the West Coast.

Although the West Coast steel-consuming industries are cheered by the Geneva rate reduction, because of its long-term implications, they continue to worry about the more immediate problem of low scrap inventories.

Scrap stockpiles of steel producers in the San Francisco area continue to dwindle, and meantime receipts of scrap are running far below normal.

This situation is summed up by E. W. Thomas, purchasing agent of Bethlehem Pacific Coast Steel Corp., who says:

"Decreasing receipts of steel scrap in the last two months have not kept pace with steelmaking furnace requirements and have forced Bethlehem Pacific plants to dig deeply into reserve stocks. This has resulted in reductions of steel output.

"Unless steel scrap receipts increase, we can expect further reductions in steel production from Bethlehem Pacific plants.

"Generally speaking, we have not been able to maintain scrap inventories."

See Scrap Receipt Improvement

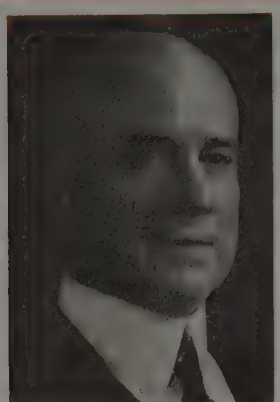
A "slight improvement" in scrap receipts during the last 30 days was reported by an official of Columbia Steel Co., but this upturn, he said, has not been sufficient to prevent the company from continuing to dip into inventories.

Judson Steel Corp. reported it is operating at a "minimum," but this reduction, it was said, is not entirely due to the scrap situation, as the company reported it was "holding its own" on scrap. Judson's difficulties have resulted from a shortage of bricklayers needed for lining furnaces.

It is possible the scrap shortage in the San Francisco area will begin to clear up next month if the proposed shipbreaking program gets under way then as scheduled. Demolition of the large number of surplus ships in San Francisco Bay would provide the region with more than enough scrap for steelmaking needs for many months.

The scrap price continues to hold firm at $19.50 for No. 1 heavy melting, delivered to the mill.

Men of Industry



B. P. TALBOT

B. B. ANDERSON

C. J. SHARP

B. B. Anderson has been appointed senior contracting manager, New York office of American Bridge Co., Ambridge, Pa., a subsidiary of United States Steel Corp. He succeeds **B. P. Talbot**, retiring after 45 years with the firm.

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Herman F. Gaertner was elected as controller, B. F. Goodrich Co., Akron, effective Dec. 31. He was assistant treasurer of the company.

—o—

Walter Voightlander has been appointed technical director and **Charles M. Zerr** chief engineer of Union Wire Rope Corp., Kansas City, Mo. Other advancements in the enlargement of Union Wire Ropes' technical service include: **Raymond O. Kasten**, assistant technical director; **Robert C. Downey**, research chemical engineer; **Omer Brenton**, assistant metallurgist; and **Dwain L. Bedford**, metallurgist in charge of the chemical, physical and metallurgical functions.

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William G. Caples has been appointed manager of industrial relations, Inland Steel Co., Chicago. Mr. Caples joined Inland Steel a year ago following war service with the Army Air Force Engineers. He had previously practiced law, was made general attorney of the Continental Casualty Co., also serving as vice president of National Casualty Co. of Detroit.

—o—

Ralph K. Davies has resigned as acting director of the Oil and Gas Division, Department of the Interior, the successor agency to Petroleum Administration for War, for which he served as deputy administrator during the entire war period. He is succeeded by **Max W. Ball**, geologist and petroleum engineer. Mr. Davies was awarded the Medal of Merit by President Truman for wartime leadership of the PAW.

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Robert W. Larson has been appointed administrative assistant to the director, General Electric Research Laboratory, Schenectady, N. Y. In 1943 Mr. Larson joined National Defense Research Committee as chief technical aide and deputy chief of division 15 which was responsible for such activities as jamming of German and Japanese radar during the war. In 1944 he became consultant for the division and assistant to the manager of the engineering department of Radio Corp. of America, Lancaster, Pa.

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Guy P. Norton has been appointed vice president, Miles Metal Corp., New York. He served with three government agencies during the war. He formerly had been associated with Sterling Bronze Co. and the Miller Co., Meriden, Conn.

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F. Rudolph Meyer has been appointed sales manager, Granite City Steel Co., Granite City, Ill. He will be located at the St. Louis branch where he has been a sales representative since 1943.

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O. W. Irwin has been named president, Rail Steel Bar Association, Chicago. For the past 11 years he was manager of sales of the Concrete Bar Division, Carnegie-Illinois Steel Corp., Pittsburgh, and was retired in 1946. Mr. Irwin will supervise and expand the research and technical activities of the association.

—o—

Harold Braun has been appointed manager of the Westinghouse Lighting Division's order service department, Cleveland. Mr. Braun has been associated with Westinghouse since 1939—in their sales organization in Cleveland since 1944, and prior as manager of the lamp and lighting department of the Westinghouse Supply Co., Pittsburgh.

—o—

C. J. Sharp was elected to the newly created office of executive vice president, Acme Steel Co., Chicago. He was formerly vice president and director of sales. Other appointments in this organization are: **John E. Ott**, general manager of consumer products; **Allen B. Wilson**, general manager of producer products; **Guy Avery**, formerly works manager, Riverdale plant, is elected to newly created office of vice president and manager of production, all plants; **B. Richards**, assistant to vice president and manager of production; **W. C. Fork**, works manager, Riverdale plant, to succeed Mr. **Avery**; and **F. R. Hyde**, superintendent, Archer plant.

—o—

W. V. Kincaid has been appointed sales representative, Pittsburgh Lectrodryer Corp., Pittsburgh, for the Tennessee valley. His headquarters will be in Knoxville, Tenn. Formerly a sales and service engineer at the Pittsburgh plant, Mr. Kincaid engaged in the development of the dehumidifying machines used by the Navy in its fleet preservation program popularly known as "Operation Zipper."

—o—

Freeman X. Kinzie has been appointed as West Coast representative of the Bearings & Babbitt Division of Joseph T. Ryerson & Son Inc., Chicago. He succeeds **O. K. Graef**, resigned.

—o—

Saul Frankel, Rochester Iron & Metal Co., Rochester, N. Y., has been elected president of the Western New York Chapter, Institute of Scrap Iron & Steel Inc. Other elections by this chapter are as follows: **D. Sloan Hurwitz**, Hur-

/hen can you ship stainless steel s?" is important—and here Armco's stless Division offers you a de-led advantage. Your order for *inless bars* can be shipped prompt-from our mill or the nearest Armco stributor.

The reason is that Armco mills are ay 'round the clock rolling more n 60 standard and special grades of stainless bars. Many grades and shapes are always on the mills and can be supplied quickly.

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witz Bros. Iron & Metal Co., Buffalo, vice president; **Leo Chapin,** Chapin & Fagin Inc., Buffalo, secretary-treasurer; **Harry Markowitz,** Syracuse, N. Y., **Philip Roth** and **Herman Schwartz,** Rochester, and **Terence Hanlon** and **J. J. Risman,** Buffalo, directors.

—o—

Ivan L. Willis has been elected a vice president of International Harvester Co., Chicago, in charge of industrial relations. Mr. Willis came to International Harvester in February, 1946, as assistant to the vice president and general counsel in charge of industrial relations. He spent many years in industrial relations work. In 1941 he was named director of industrial relations by the Curtiss-Wright Corp. and was with it during the war.

—o—

John A. Fry, president, Detroit-Michigan Stove Co., Detroit, was elected to the board of directors of Detroit Steel Products Co., Detroit.

—o—

H. R. Moorhouse and **James Krumhansl,** associated with Arthur G. McKee & Co., Cleveland, have been elected as secretary and treasurer, respectively, of that company. They succeed **Robert E. Baker,** resigned, who served as secretary and treasurer of the company since its incorporation.

—o—

Robert C. Judd has been appointed market research manager, R. G. LeTourneau Inc., Peoria, Ill. He replaces **Wendell Richards** who resumes his district sales representative activities.

—o—

John L. Collyer, president, B. F. Goodrich Co., Akron, O., was recently awarded the Medal for Merit by Secretary of War Robert Patterson for meritorious service in wartime. Mr. Collyer served as special director of rubber programs for the government during the most critical periods of the tire and rubber shortage and since the conflict ended, has been an advisor to the state department in international negotiations on rubber.

—o—

Vannevar Bush and **Arthur Raymond** have been reappointed by President Truman to the National Advisory Committee for Aeronautics, for 5 year terms.

—o—

Christie W. Hohe has withdrawn as a partner and is no longer associated with Paragon Spring Co., Chicago.

—o—

Howard L. Steck has been named comptroller of the Landis Machine Co., Waynesboro, Pa. Other appointments made by this organization are: **Leslie M. Hess,** assistant treasurer; and **Donald S. Fitz,** purchasing agent.

—o—

Richard H. Stone, sales manager, Vesuvius Crucible Co., Pittsburgh, has been named chairman of the 1946-47 refractories committee of American Foundrymen's Association.

—o—

J. Halsey McKown, assistant vice president of sales, United States Steel Corp., Delaware, has retired after serving 41 years with U. S. Steel subsidiaries. **G. R. Schreiner,** formerly advertising manager, Carnegie-Illinois Steel Corp., has been appointed assistant director of advertising to succeed **Reese H. Price** who has resigned. **Harold L. Challenger,** recently retired after 29 years in the United States Navy, has been named assistant sales organization counsel for the United States Steel Corp., Delaware.

—o—

Deppen Kline has been appointed Buffalo district sales manager, Bliss & Laughlin Inc., with headquarters at Buffalo. Mr. Kline returns to Bliss & Laughlin after serving during the war with WPB and as a lieutenant with the Navy.

—o—

Robert B. Semple, Monsanto Chemical Co., St. Louis, Mo., has been appointed director of the general development department. He will be succeeded as petroleum chemicals sales manager by **John Wade Newcombe** of the petroleum sales department. Mr. Semple joined the Monsanto company in 1933 as a research chemist and was promoted to assistant director of the general development department. He has been petroleum chemicals sales manager since 1944. **William G. Krummrich** has been promoted to assistant division general manager, Organic Chemicals Division. He is succeeded in his previous position of division production manager by **David L. Eynon Jr.,** who has been assistant to the division general manager and acting plant manager at Nitro, W. Va.

—o—

Harry E. Lorenz has been appointed purchasing agent of Carnegie-Illinois Steel Corp., U. S. Steel subsidiary, in Pittsburgh. **C. H. Baringer** and **F. G. Buchheit** have been made assistant purchasing agents for the corporation.

—o—

C. E. Frudden has been named president, Society of Automotive Engineers Inc., New York, for the coming year. He succeeds **L. Ray Buckendale,** Timken-Detroit Axle Co., Detroit. Mr. Frudden is consulting engineer for the Tractor Division, Allis-Chalmers Mfg. Co., Milwaukee.

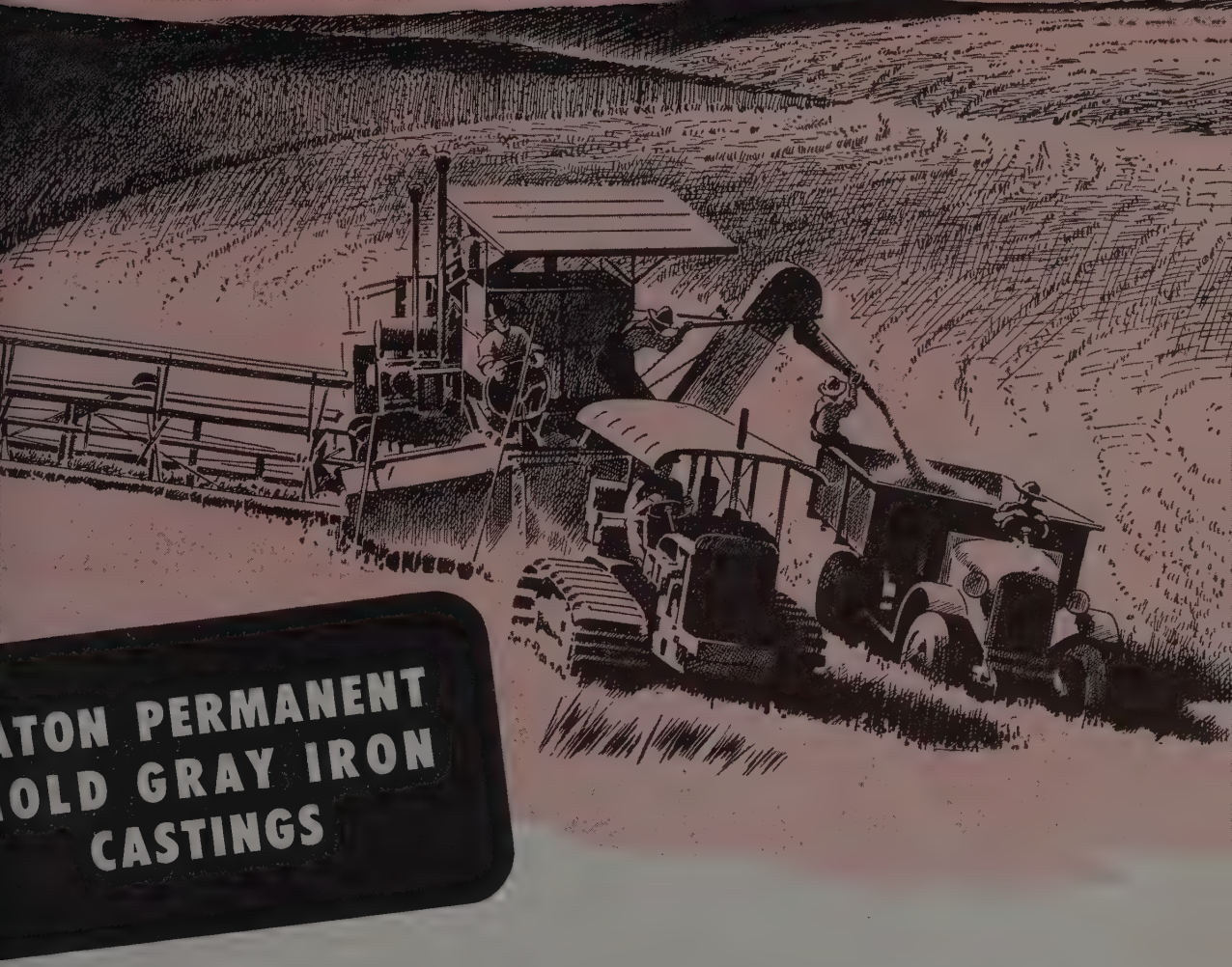
—o—

Bethlehem Pacific Coast Steel Corp. has announced the following executive changes: **Harvey Hewitt,** formerly manager of sales of the company's Los Angeles district, has been named vice president in charge of sales. He succeeds **Paul W. Cotton,** retired. **William J. McClung,** formerly general manager in

ROBERT C. JUDD

J. HALSEY McKOWN

C. E. FRUDDEN



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OLD GRAY IRON
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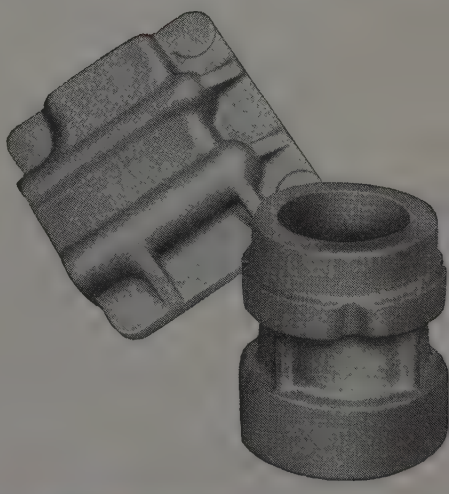
Contribute Stamina to Farm Machinery

Strength, free machinability, good bearing surfaces, uniform structure—these are qualities which make Eaton Permanent Mold Gray Iron Castings ideal for a wide range of applications in the manufacture of farm machinery. Their dense, non-porous structure insuring freedom from leakage under pressure recommends Eaton Permanent Mold Gray Iron Castings particularly for hydraulic equipment. Proper annealing insures that castings will hold size and not distort after machining.

Eaton Foundry Division engineers will be glad to discuss the application of Permanent Mold Gray Iron Castings to your products. Send for your copy of the illustrated booklet "The Eaton Permanent Mold Process."



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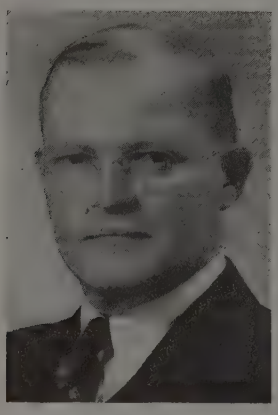


CHARLES POTTER

charge of operations of steel plants and mill depots, has been named vice president of that division. He succeeds **T. S. Clingan,** retired. **Lionel J. Soracco,** general superintendent of the Los Angeles plant, will succeed Mr. Hewitt as manager of sales in the Los Angeles district, and **J. T. Rea** succeeds Mr. Soracco as general superintendent at the Los Angeles plant. **Willard S. Briscoe** has been named manager of publications in charge of a newly-created public relations department.

—o—

Kier M. Boyd has been appointed assistant manager of sales, strip and sheet products, Jones & Laughlin Steel Corp., Pittsburgh. He started with the company in 1926. **Charles Potter** has been appointed manager, J & L Pittsburgh warehouse. He succeeds **J. M. Hilbish,** retired after 28 years with the company.

—o—

Raymond Rubicam has been named chairman of the Committee for Economic Development, research and policy committee, New York, succeeding U. S. Senator **Ralph E. Flanders.** Until his recent retirement, Mr. Rubicam was chairman of Young & Rubicam advertising agency, New York, of which he was co-founder. Other appointments to CED are: **Henry R. Johnston,** named executive director succeeding **C. Scott Fletcher,** and **John H. Van Deventer,** appointed director of information.

—o—

Edward R. Anderson was appointed district manager for California, Hendey Machine Co., Torrington, Conn., with offices in Los Angeles and San Francisco.

—o—

John E. Garlent has been elected president, Motor Wheel Corp., Lansing, Mich., to succeed **Harry F. Harper,** president and general manager since the inception of the company in 1920. Mr. Garlent has been executive vice president since 1940.

—o—

W. F. Boyle has been named vice president, Pelton Water Wheel Co., San Francisco, subsidiary of Baldwin Locomotive Works, Eddystone, Pa.

—o—

John P. McWilliams was elected to the board of directors, Union Carbide & Carbon Corp., New York.

—o—

Donald A. MacNeil has joined the sales staff of the forging division, Tube Turns Inc., Louisville, Ky., with headquarters in Chicago.

—o—

A. C. Meyers has been appointed manager of the nickel department, Williams & Co., Pittsburgh.

—o—

Harrison M. Lavender, vice president and general manager, Phelps Dodge Corp., Douglas, Ariz., has been elected chairman of the board of governors, Western Division, American Mining Congress.

—o—

Kenneth T. Fawcett has been appointed vice president of Dominion Brake Shoe Co. Ltd., Canadian subsidiary of American Brake Shoe Co., New York.

—o—

James E. Kendig has been appointed manager of the newly established eastern sales division, Acme Aluminum Alloys Inc., Dayton, O. His headquarters will be at South Philadelphia, Pa.

—o—

Thomas J. Bannan, president, Western Gear Works, Seattle, will assume the duties of regional vice president of the National Association of Manufacturers in the Pacific northwest.

—o—

Rollo E. Falk, formerly vice president

GEORGE P. HOUGH
Named executive administrator, Chicago district, A. O. Smith Corp., Milwaukee. Noted in STEEL, Dec. 30, p. 62.

EARL SCHOFIELD

in charge of manufacturing, and a director of Revere Copper & Brass Inc., New York, has resigned to open his own offices in New York. He will specialize as consultant in operating problems in the nonferrous metal industry.

—o—

G. L. Runkle has been appointed chief engineer, Superior Coach Corp., Lima, O. He was previously associated with Henney Motor Co., Freeport, Ill. **Earl Schofield,** recently chief engineer for the Henney Motor Co., has been retained by Superior as consultant engineer.

—o—

Francis M. Sherwin has been elected president, the Brush Beryllium Co., Cleveland. He succeeds **Dr. C. Baldwin Sawyer** who becomes chairman and director of research. **Frank T. Humiston Jr.** was appointed treasurer and assistant to Mr. Sherwin.

—o—

James A. MacMillan, treasurer, Geometric Stamping Co., Cleveland, has been promoted to executive vice president of the company. He will retain his position as treasurer.

—o—

Lee C. Daniels has been promoted to chief engineer of Towmotor Corp., Cleveland.

—o—

Arthur Nuesse, secretary, Wesley Steel Treating Co., Milwaukee, has been named executive assistant to Rep. John Brophy. He will go to Washington to take over his new duties.

—o—

C. D. Allen has been appointed special representative, Standard Steel Works Division of Baldwin Locomotive Works for the Pacific Coast. **J. F. Kirkland** succeeds him as manager of transportation, sales and service for the Pacific Coast district of the organization.

—o—

Willard K. Fohl, after two and one-half years active duty with U. S. Navy,

ARTHUR TUCKERMAN

Appointed director of public relations, American Car & Foundry Co., New York. Noted in STEEL, Jan. 13, p. 74.

FRANK B. LOUNSBERRY

Appointed technical director, Allegheny Ludlum Steel Corp., Pittsburgh. Noted in STEEL, Jan. 13, p. 74

A. R. STARGARTDER

Named metallurgist of Washington Steel Corp., Washington, Pa. Noted in STEEL, Jan. 13, p. 76.

has returned to Lukens Steel Co., with whom he has been associated since 1937. Mr. Fohl has recently been named manager, Railroad Division of Lukens Steel and subsidiaries, By-Products Steel Corp. and Lukenweld Inc., Coatesville, Pa.

—o—

Carl E. Lyon has retired as vice president and director of purchases, Cribben & Sexton Co., Chicago, but will continue his association with the company in an advisory capacity. He has been with the company for 46 years.

—o—

Donald W. Hornbeck has resigned as president of the National Bronze & Aluminum Foundry Co., Cleveland. He is succeeded by William I. Neimeyer, vice president in charge of operations for the past two years.

—o—

Waldemar Naujoks has resigned as chief engineer, the Steel Improvement Forge Co., Cleveland. He is the author of numerous technical articles on forging techniques and co-author of *Forging Handbook.*

OBITUARIES . . .

Frank S. McKenna, retired, McKenna Brothers Brass Co., Pittsburgh, died Jan. 11 in Pasadena, Calif.

—o—

George K. Leet, 74, retired secretary, United States Steel Corp., died recently at his home at Montclair, N. J. He had held this post with the corporation for 19 years.

—o—

Joseph M. Schatzer Sr., 53, died recently after being associated for 37 years with the electrical division staff of Singer Mfg. Co. at Elizabeth, N. J.

—o—

Charles Cummings, 64, founder and president, Cummings-Landau Laundry Machine Co., Brooklyn, died recently.

—o—

Thomas Wallace, 86, retired head of the Ansonia Electric Co., New Haven, Conn., died recently. The company was purchased in 1942 by the Noma Electric Co.

—o—

J. F. Schwab, 58, vice president, Revolving Door Inc., New York, died recently of a heart ailment.

—o—

E. Kay Ford, 57, vice president, Hanna Furnace Corp., Detroit, died in that city Jan. 8. He had been associated with Hanna Furnace, a unit of National Steel Corp., since 1920, and was active in affairs of the American Iron & Steel Institute, Detroit Foundrymen's Association and American Foundrymen's Association.

—o—

Ivan V. Assaykeen, mechanical engineer, Worthington Pump & Machinery Corp., Harrison, N. J., died Jan. 8 in Philadelphia. He lived at Summit, N. J.

—o—

Charles B. Carr, 83, former Cleveland district manager of the Gisholt Machine Co., Madison, Wis., died in Cleveland recently.

—o—

Henry Pope Sr., 78, president of Paramount Textile Machinery, Chicago, died recently.

—o—

Alonzo F. Ruch, 58, president of the Inter-State Plumbing Supply Co., Albany, N. Y., died Jan. 11.

—o—

Levi M. Davenport, 85, retired head of L. M. Davenport Co., died recently in Pasadena, Calif.

—o—

John W. Bray, 79, died Jan. 4 after a long illness. He was a director of the Bullard Co., Bridgeport, Conn.

—o—

Charles E. O'Rourke, 50, head of the structural engineering department, Cornell University, died Jan. 10.

—o—

John W. Dammers, 56, treasurer, G. S. Blakeslee & Co., Cicero, Ill., died recently in Oak Park, Ill. He had been associated with the company for 33 years.

—o—

Everett G. Young, 58, professor of railway mechanical engineering, University of Illinois, died Jan. 10 in Urbana, Ill. A specialist in locomotive design, he became a member of the faculty in 1927 after spending seven years in China, working for the Chinese government.

—o—

Samuel Farrell, Pittsburgh representative, Rollway Bearing Co. Inc., Syracuse, N. Y., died at his home in Youngstown on Jan. 10.

—o—

John M. Krupp Jr., president of Lansdale Porcelain Enamel Corp., Lansdale, Pa., died Jan. 7.

—o—

Ben F. Taylor, assistant advertising manager of the American Air Filter Co. Inc., Louisville, died recently.

—o—

Lewis M. Walker Sr., 70, died at his home in Newark, N. J., Jan. 12. Until his retirement in 1945 he was sales engineer with the United States Steel Corp., New York.

OXIDATION

Resistance of alloys to oxidation is controlled largely by ability of metal to form an oxide of low electrical conductivity and high melting point. However, the effect of small amounts of impurities in the gas atmosphere and in the base metal, and sensitivity of the scaling rate to other factors preclude predictions regarding the range of stability of materials in oxidizing atmospheres

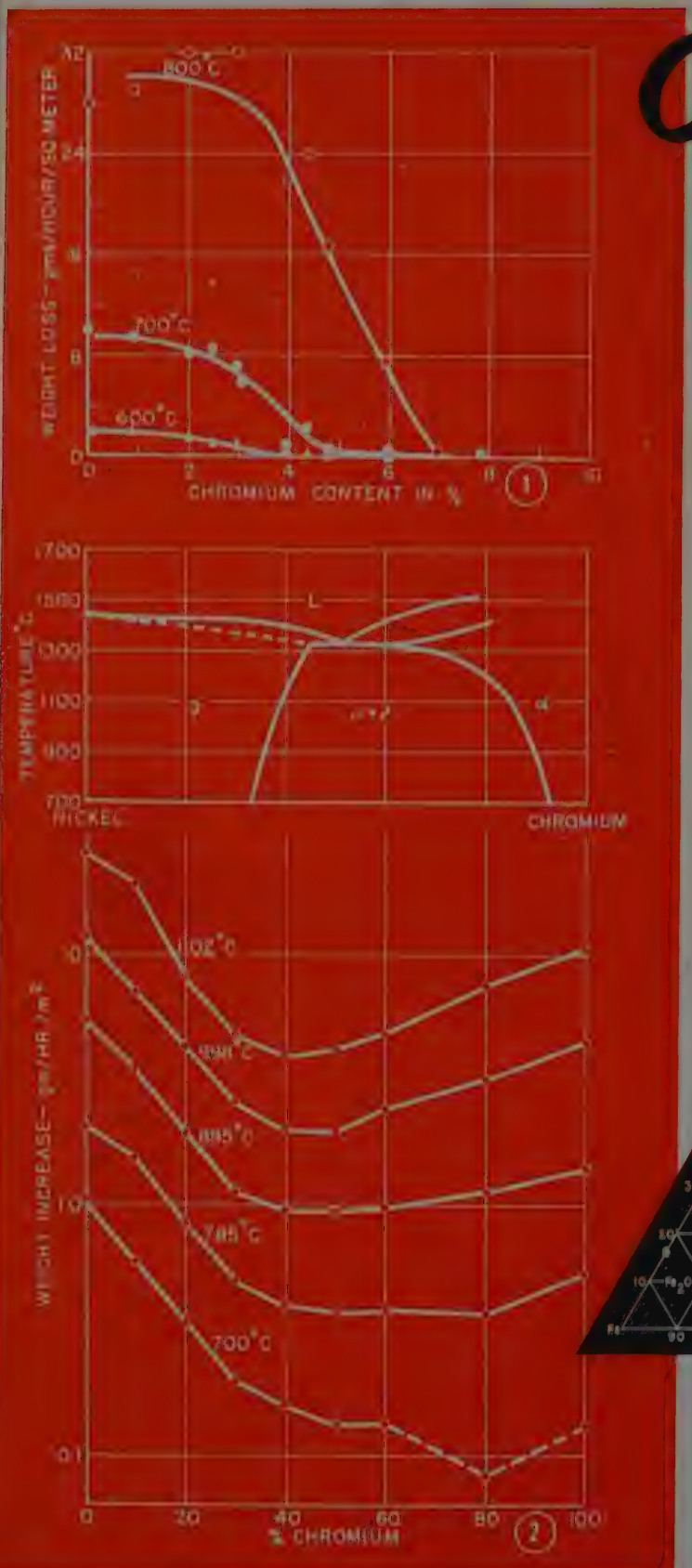


Fig. 1—Effect of chromium content on the scaling after 120 hours in air of a 0.15 per cent carbon and 0.7-0.9 per cent silicon steel, Houdremont[11]

Fig. 2—Relation between scaling and phase diagram of chromium-nickel alloys, Matsunaga[15]

Fig. 3—Constituents of scale layers in iron-nickel-chromium alloys[14, 7]

Resistant Alloys

By BENJAMIN LUSTMAN
Metallurgical Section, Research Laboratories
Westinghouse Electric Corp.,
East Pittsburgh, Pa.

NATURE and extent of attack on metals and alloys when heated in oxidizing environments is determined largely by properties of the scale formed, its structure, chemical composition, melting and boiling points. The metal base and gas environment are generally of importance only as they affect the scale. From numerous investigations, it has been found that at high temperatures the oxidation of many metals proceeds according to a parabolic relation:

$$x^2 = kt \qquad (1)$$

where x is weight or thickness of metal consumed or scale formed, t is time and k the parabolic rate constant. Such an equation is theoretically to be expected if oxidation proceeds by a process of metal or oxygen diffusion through the scale.

The essential condition for the validity of this equation was shown by Pilling and Bedworth[1] to be the formation of a dense and adherent scale, a condition which results when the specific volume of the oxide is equal to or greater than that of the metal; i.e., when

$$\frac{Md}{mD} \geqslant 1 \qquad (2)$$

where M and D are the molecular weight and density of the oxide respectively and m and d those of the metal. Values of this ratio for the oxides formed on various metals are shown in Fig. 4. Those metals underlined have been found by experiment to form adherent, protective scales increasing in weight or thickness with time according to equation (1). The almost general validity of the Pilling and Bedworth rule may be appreciated by examination of this table.

As in other diffusional processes, the variation with temperature of oxidation rate or the parabolic rate constant "k" of equation (1) may be expressed by an Arrhenius equation:

$$k = Ae - Q/RT \qquad (3)$$

where A and Q are constants, R is the gas constant, T is absolute temperature and e the base of natural logarithms. Thus a plot of logarithm of oxidation rate versus reciprocal of absolute temperature of oxidation yields a straight line.

Weight of scale formed on those metals, the specific volumes of whose oxides are smaller than that of the metal increases linearly with time. The resultant scale is then porous and crumbly and the rate of attack controlled only by the specific reactivity of the metal and the composition of the gas atmosphere. Exceptions to the Pilling and Bedworth rule have thus far been noted only in case of tungsten and molybdenum. These metals, in spite of a much higher specific volume of oxide than of metal as shown in Fig. 4, form nonprotective oxides which increase in weight proportionally to reaction time[2]. The oxidation of molybdenum is further complicated by the high vapor pressure and relatively low melting point of the predominant oxide MoO_3.

Still a third class of metals exists, the noble metals, the dissociation pressures of whose oxides are higher than the partial pressure of oxygen in air at the oxidation temperature and which, therefore, form no superficial oxide. Thus silver forms a superficial oxide at low temperatures which decomposes on heating to 300° C at which the decomposition pressure of Ag_2O equals the partial pressure of oxygen in air. Cladding with such noble metals has been proposed as a means for protection of base metals but is useful only at moderate temperatures. Because of the appreciable solubility and high rate of diffusion of oxygen in such metals at elevated temperatures, oxygen penetrates to the base metal and forms a layer of oxide at the base metal-noble metal interface.

The theory of the scaling of metals which form protective oxides has been far advanced in recent years by the researches of Wagner[3]. Pfeil[4], on the basis of various experimental facts, concluded that during the oxidation of iron, iron ions diffused from the metal through the oxide to the oxide-gas interface and there reacted with oxygen. Wagner showed that in addition to negatively charged oxygen ions, both electrons and positively charged metal ions migrate through the oxide layer. The scale may be considered an electrolytic cell with the metal base cathode and the gas atmosphere anode short-circuited by an external resistance analogous to electron conduction through the oxide. The electro motive force (EMF) of such a cell is given by the free (*Please turn to Page* 116)

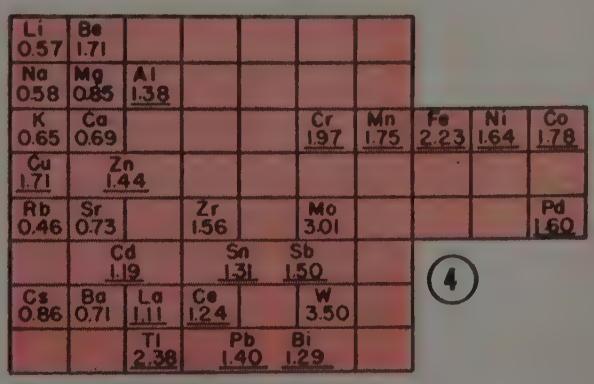


Fig. 4—Ratios of specific volumes of oxide and metals

By EUGENE GODDESS
Quality Engineer
North American Philips Co. Inc.
Dobbs Ferry, N. Y.

Quality Control HANDBOOK

By carefully following the step-by-step procedure outlined in this "example", a quality control program is established that provides a permanent record. This will furnish information regarding the state of control at each machine and thus improve production

---

Issued for Control of: *Depth of Grid Assemblies*

Book No. *1*

Issued to *Jane Jones*

A. STARTING THE CONTROL

A-1. Obtain a sample of *5 Grid Assemblies* from *Parts sub-assembly* every *30 min.* If you have any difficulty in obtaining the sample, contact the foreman, *Mr. Smith*., or the Quality Engineering Section.

A-2. Immediately measure the *depth* of the *grids* using a *depth micrometer* available for your use in the *Inspection Department*. Measurements should be made at once so that information about the state of control will be instantly available. Difficulties in making the measurement should be referred to *Quality Engineering Section*

A-3. Using form No. *NC 1233* (Control Chart Data Sheet), sample attached, record directly each measurement in the first blank column. Your measurement should be carried out to *4* decimal places, i.e., *0.2564"*

A-4. Add together the *5* measurements and enter the sum in the rectangle marked "TOTAL".

A-5. Divide the sum by *5*, the number of samples, and enter your answer, the average in the rectangle marked $\bar{X}$, which is read as "bar X" and means the average value of the X's (measurements) added together.

A-6. Enter the largest of the *5* measurements in the rectangle marked "MAX".

A-7. Enter the smallest of *5* measurements in rectangle marked "MIN".

A-8. Subtract the smallest of the *5* measurements from the largest and enter the difference in rectangle marked "R", which means range and accordingly indicates the range of readings encountered in the sample of measurements.

A-9. Using form No. *NC 1234* (Control Chart Record), plot the value of $\bar{X}$ and R on their respective portions of the form as per sample attached. This form can accommodate the plot points of *120* samples. The first *120* samples are to be numbered from *1-1* to *120-1*. When plotting form is used up, and the second *120* samples are to start, they should be numbered from *1-2* to *120-2* In other words, the sample is to be designated by two groups of numbers separated by a hyphen. The first group of numbers gives sample identity; the second group of numbers gives control chart record identity.

A-10. After *20* values of $\bar{X}$ and R have been computed and plotted, add up the *20* values of $\bar{X}$ and divide their sum by *20*. The answer is called "bar Bar X", and is written $\bar{\bar{X}}$. It represents the average of the averages.

A-11. Plot $\overline{\overline{X}}$ as a line extending for 48 samples, (6 – 8 hour working days).

A-12. Add together the corresponding 20 values of R and divide their sum by 20 The answer is $\overline{R}$, read "Bar R", and represents the average range.

A-13. Plot $\overline{R}$ as a line extending for 48 samples, (6 – 8 hour working days).

A-14. Multiply $\overline{R}$ by 0.577 . Add this product to $\overline{\overline{X}}$. Plot the sum on the "$\overline{X}$-Chart" as a line extending for 48 samples. This line is the upper limit of the average or "X_L upper".

A-15. Subtract the product of R x .577 from $\overline{\overline{X}}$, and plot the difference as a line on the "$\overline{X}$-Chart" extending for 48 samples. This value is termed "X_L lower".

A-16. Compute the upper control limit for $\overline{R}$ as equal to 2.114 x $\overline{R}$. This value is noted as "R_L upper". Plot R_L upper on the R chart as a line extending for 48 samples.

A-17. Compute the lower control limit for $\overline{R}$ as equal to 0 x $\overline{R}$. Plot this value (termed "R_L lower") on the R chart as a line extending for 48 samples.

A-18. Plot the specified limits on the $\overline{X}$-chart as lines extending the length of the graph. For this control, the specified limit is 0.255" ± 0.001" ; hence the reject lines are 0.2560" and 0.2540"

A-19. Compare $\overline{\overline{X}}$ to the center of the specification. If the difference in their values is more than 5 %, in this case 0.0001, advise the foreman Mr. Smith that the control cannot start until $\overline{\overline{X}}$ and the center of the specification are closer.

A-20. If either X_L upper or X_L lower is further from $\overline{\overline{X}}$ than either of the reject lines, advise the foreman Mr. Smith that his product is exhibiting excessive range and that the control cannot start.

A-21. Note on your chart the nature of your conversation with Mr. Smith and such steps as he may be taking to alter the process.

CONTROL CHART DATA SHEET

PRODUCT Grid Assemblies — CUSTOMER Maunting Dept. — PROD. DEPT Parts Sub Assem.
CHARACTERISTIC Depth — PART NO 765-T9 — MACHINE 106
METHOD OF MEASUREMENT Micrometer — ORDER NO J 747 — QUOT. NO
SPECIFIED LIMITS .255" ± .001" — NORMAL HOURLY OUTPUT 175
SAMPLE SIZE 5/30 Min.

LOT NO.	1-1	2-1	3-1	4-1	5-1	6-1	7-1	8-1
TIME	8:15 A	8:45	9:15	9:45	10:15	10:45	11:15	11:45
INSPECTOR	A.B.S.	J.J	J.J.	J.J.	J.J.	J.J.	J.J.	J.J.
	.2547	.2553	.2555	.2552	.2551	.2554	.2551	.2553
	.2550	.2549	.2546	.2548	.2547	.2555	.2552	.2549
	.2545	.2555	.2549	.2548	.2552	.2555	.2551	.2549
	.2547	.2548	.2542	.2547	.2553	.2547	.2543	.2544
	.2546	.2550	.2548	.2550	.2552	.2554	.2554	.2550
TOTAL	1.2735	1.2755	1.2740	1.2745	1.2755	1.2765	1.2751	1.2745
$\overline{X}$	.2547	.2551	.2548	.2549	.2551	.2553	.2550	.2549
MAX.	.2550	.2555	.2555	.2552	.2553	.2555	.2554	.2553
MIN.	.2545	.2548	.2542	.2547	.2547	.2547	.2543	.2544
R	.0005	.0007	.0013	.0005	.0006	.0008	.0011	.0009
NO. OF DEFECTS	None	None	None	None	None	None	None	None
LOT NO.	9-1	10-1	11-1	12-1	13-1	14-1	15-1	16-1
TIME	12:15P	12:45	1:15	1:45	2:15	2:45	3:15	3:45
INSPECTOR	J.J.	J.J.	J.J.	J.J.	J.J.	J.J.	J.J.	J.J.
	.2549	.2554	.2548	.2550	.2542	.2550	.2547	.2554
	.2548	.2546	.2549	.2547	.2543	.2554	.2548	.2550
	.2551	.2554	.2543	.2546	.2540	.2551	.2545	.2545
	.2540	.2549	.2549	.2545	.2551	.2547	.2556	.2550
	.2542	.2552	.2546	.2552	.2549	.2549	.2554	.2546
TOTAL	1.2730	1.2755	1.2735	1.2740	1.2725	1.2751	1.2750	1.2745
$\overline{X}$	.2546	.2551	.2547	.2548	.2545	.2550	.2550	.2549
MAX.	.2551	.2554	.2549	.2552	.2551	.2554	.2556	.2554
MIN.	.2540	.2546	.2543	.2545	.2540	.2547	.2545	.2545
R	.0009	.0008	.0006	.0007	.0007	.0007	.0011	.0009
NO. OF DEFECTS	None	None	None	None	None	None	None	None

A-22. Continue comparing new sample lots as described in steps 1 - 20 until steps 19 and 20 are such that the control can start.

A-23. On the chart, extend the satisfactory control lines for 25 samples.

A-24. If .1. point(s) fall(s) outside the control limits (the values of X_L upper or X_L lower) notify the foreman.

A-25. Obtain all the production made between the out-of-control-limit sample and the previously acceptable sample.

A-26. Submit this product to piece by piece inspection, accepting the good and rejecting the defective.

A-27. If .2. or more points fall outside the control limits, notify the foreman .Mr. Smith., the production engineer .Mr. Roth., and the Quality Engineering office representative.

A-28. If .2. or more points fall outside the specified or reject limits take action as outlined in steps 25, 26 and 27.

A-29. Advise the foreman .Mr. Smith. of any series of points indicative of a trend.

A-30. If .25. consecutive values of $\overline{X}$ and R fall between the upper and lower control limits, we can say that control exists, in which case the limits may be extended for .25. additional samples.

A-31. If not more than .1. value(s) of $\overline{X}$ or R is ~~are~~ outside of control limits in .35. samples, we can say that control exists, in which case the limits may be extended for .25. additional samples.

A-32. If not more than .2. value(s) of $\overline{X}$ or R ~~is~~ are outside of control limits in .100. samples, we may say that control exists, in which case the limits may be extended for .25. additional samples.

A-33. If good control exists (as described in steps 24, 25 and 26) X and R may be adopted as standard values, i.e. $\overline{\overline{X}}=\overline{X}'$ and $\overline{R}=R'$.

A-34. If good control does not exist, use only that portion of the data which can be considered as representative to recompute $\overline{\overline{X}}$ and $\overline{R}$ as described in section B following.

B. RECOMPUTATION X AND R

B-1. If good control exists as described in A-34, use only that portion of the data which can be considered as representative to recompute $\overline{\overline{X}}$ and $\overline{R}$. Discard those values which you know to be not representative of the process for some specific engineering or manufacturing reason.

B-2. With the non-representative samples discarded, recompute $\overline{\overline{X}}$ and $\overline{R}$ as per paragraphs A-10 and A-12. Let the new values be identified as $\overline{\overline{X}}=\overline{X}'$ and $\overline{R}=R'$.

B-3. Divide $\overline{R}$ (from paragraph B-2) by .2.326. The result is called "sigma prime" (written σ') and is indicative of the spread or dispersion of the individual measurements about their average.

B-4. The maximum specified value, X max, of the .Grid Depth. is .0.2560". From this value subtract the value of $\overline{X}'$ ($=\overline{\overline{X}}$, as computed in paragraph B-2).

B-5. Divide the difference found in paragraph B-4 by three times the value of sigma prime found in paragraph B-3. This value must be greater than 1, i.e. $\dfrac{X\ max-\overline{X}'}{3\sigma'}>1.$

B-6. If the value of $\dfrac{X\ max-\overline{X}'}{3\sigma'}$ is not greater than 1, advise .Mr. Judith. of the Quality Engineering Section before proceeding.

B-7. If the value of $\dfrac{X\ max-\overline{X}'}{3\sigma'}$ is greater than 1, then $\overline{\overline{X}}$, the average of the averages is equal to $\overline{X}'$.

B-8. Compute the upper limit of X by adding 1.342 x σ to $\bar{\bar{X}}$ (=$\bar{X}'$), i.e., X_L upper = $\bar{\bar{X}}$ + (1.342 σ).

B-9. Compute the lower limit of X by subtracting 1.342 x σ from $\bar{\bar{X}}$ (=$\bar{X}'$), i.e. X_L lower = X − (1.342 σ).

B-10. The central control line for R is $\bar{R}$, which is equal to R′ as found in paragraph B-2, i.e. $\bar{R} = R' = (2.326 \times \sigma)$.

B-11. The upper control limit for R is 4.918 x σ, i.e., R_L upper = 4.918 x σ.

B-12. The lower control limit for R is 0 x σ, i.e., R_L lower = 0 x σ.

B-13. Plot $\bar{\bar{X}}$, X_L upper, X_L lower, R, R_L upper, and R_L lower on the control chart.

B-14. Continue to sample as outlined in paragraphs A-23 through A-32.

C. ADMINISTRATIVE INFORMATION

C-1. When the control chart record is completed, the chart together with the data sheets corresponding thereto are to be filed in the offices of the Quality Engineering Section.

C-2. During the work day keep your controls where the foreman and the production engineer have access to them. At the end of the working day, return all your controls to Mr. Judith in the Quality Engineering Section.

D. CONCLUSION

D-1. Measure accurately. Beware of personal and instrumental errors.

D-2. Check all arithmetical work.

D-3. Plot values as soon as computed.

D-4. Establish limits on schedule.

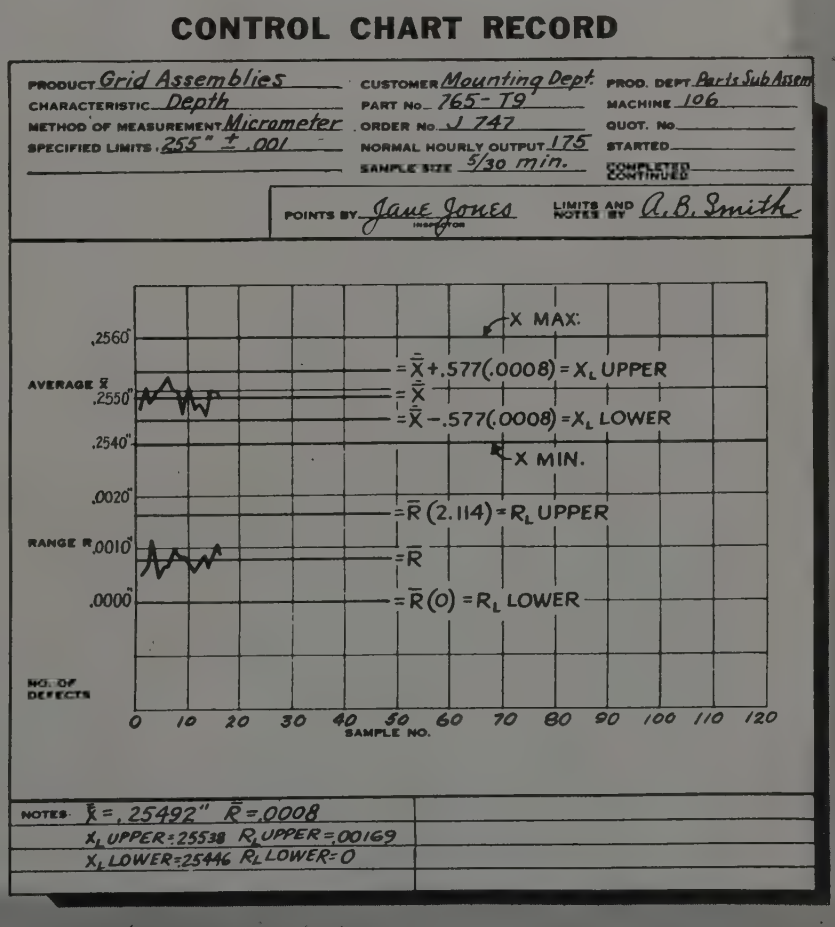
D-5. Notify proper persons on points out of limits, trends, or eccentricities.

D-6. Don't be absent. (You probably know more about your control than anyone else. If you are not here, production can suffer.)

D-7. Keep your work accessible.

D-8. Feel free to discuss your controls with the Quality Engineering Section.

D-9. Be unbiased. It makes little difference who is right—as long as the product is.



Induction

Selection of proper equipment for hardening is important for economic success of many applications, but it does not guarantee complete success. In this second article of a series, the authors explain other items to be considered such as coil design and quenching fixtures

SELECTION of induction heating equipment for hardening is important for the economic success of many applications. The problem is to select a high frequency generator which will permit obtaining the desired hardening results at the minimum of cost. Factors to consider in making this choice are: Power output of the equipment, frequency, initial costs, and operating cost of equipment including maintenance.

It is possible to calculate approximate values of the required frequency and power rating of the oscillator by following the method outlined by Stansel[5] and Kinn[6]. In general, however the estimated values serve only as rough guides in making a choice. Final selection will depend upon size and shape of the part being hardened, and the rate of production desired. In general, the final choice is made by comparing the results at different frequency and power conditions[7]. Also, the problem is to determine whether the frequency should be in the range of 3000 to 10,000 cycles or 300,000 to 500,000 cycles.

Proper selection of equipment, however, does not guarantee complete success of the induction hardening operation. Other factors such as the coil design, quenching fixture and metallurgical aspects also must be considered, if full value of the induction equipment is to be received.

Coil Design: Successful application of induction heating to the hardening of steel parts depends to a large degree upon proper coil or inductor design. These coils usually are of round or square copper tubing, although they can be formed or cut from sheet copper. In each case, it is essential to cool the coil to prevent melting. Coils may be of multiturn or single-turn design.

In designing coils for induction heating, it must be remembered that heat generated in a part is directly related to the magnetic field set up by the alternating current carried by the coil. Density of this field is directly proportional to the number of ampere turns in the coil, which is equal to the number of effective turns times the coil current. Coupling or clearance from coil to part to be heated also is very important, since the field strength is maximum adjacent to the coil and diminishes inversely as the square of the distance from the coil. If loosely coupled—that is, if there is considerable clearance from coil to part—the heating will be slower and the depth of heat penetration will be greater because of heat conduction.

Shape of the coil should conform to the contour of the part to be heated if a uniform depth is desired, except in cases where there are sharp edges or corners to be considered. Concentration of flux occurs at sharp contours, and heat conduction away from these areas is slower because of lack of mass. The coil should, then, be farthest away from the part at these points.

Construction and shaping of multiturn coils for uniform hardening results, requires skill and ingenuity on part of the operator. For many applications, heating coils are sold as auxiliary equipment, and the user of the oscillator will not have to be concerned with their construction. In other instances, the heating coils are constructed by the user. In that event the book by Curtis[8], and articles by Babat[9] are suggested as sources of information on design and construction of coils.

Single-Turn Coils: If the portion of surface of a part to be hardened is wide enough so a multiturn coil of several turns can be brought close to it, there is generally not much difficulty in generating enough heat in the part to bring it to the austenitizing temperature rapidly. If the area to be treated is small, it may be a problem to produce heat in it fast enough with a multiturn coil to overcome the conduction of heat away from this surface. This is particularly true if there is a large adjacent mass. Reason for this is that the portion to be hardened is so small that it is physically impossible to get more than a turn or two of a multiturn coil in close proximity with it. In many cases a solution may be found by increasing the current carried by a single-turn coil.

Heat generated in a workpiece, of course, is directly proportional to the number of ampere turns in the inductor coil used to heat it. Ampere turns are equal to coil current times the number of effective turns in the coil. Generally, multiturn coils are connected directly to the terminals of the high frequency generator, which means that the coil current will be in the magnitude of approximately 100 to 300 amp. This varies of course for different types and ratings of equipment.

For an example, assume a part to be heated is of such a nature that it is possible to bring only one turn of a work coil into position for heating it, and that only 200 amp of high frequency current are available directly from the oscillator. This coil then, has 200 amp turns, which is not enough to produce the desired heating. Since it is impossible to increase the number of turns, the only way to secure a higher ampere turn value is to increase the current carried by the single-turn coil. It is likely that a current of, for example, 1000 amp in the single-turn coil would be sufficient to set up a field strong enough to gen

Hardening OF STEEL

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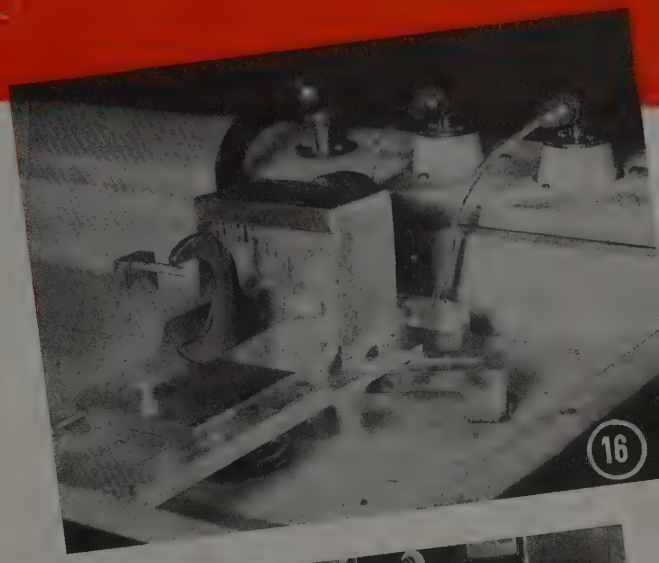


Fig. 13—Typical single-turn inductor coil for use with current transformer. Inserts are brazed to coil at A for even heating

Fig. 14—Inductor coil in position for progressively hardening of male bending die. Coil is single-turn hairpin type, used with current transformer

Fig. 15—Diagram showing current transformer with single-turn work coil connected to terminals of electronic heater. Note ground connection to work coil

Fig. 16—Fixture for hardening a shift fork, showing adaptation of spray quench to irregularly-shaped parts

Fig. 17—Nozzle quench for directing water, for surface hardening wearing surfaces of clutch plate used in oil-well hoist equipment. View shows part lowered away from inductor coil, in position for indexing, while being quenched

ate the required heat in the part. Current of this, and en higher values can be secured by use of a simple vice known as a high frequency current transformer. In general, a current transformer for use with high-quency power is made up of a multiturn primary and single-turn secondary, coupled as closely as voltage itations will permit. In other words, clearance between mary and secondary is as small as possible but the ace must be sufficient to eliminate possibility of arcing tween them. The work coil is fastened directly to the minals of the secondary of the transformer so that the rrent induced in the secondary will have to flow through e work coil. A single-turn work coil is generally used th the current transformer, although more than one turn y be used for some applications. Fig. 22 shows a cur-

rent, or output transformer as it is sometimes called. Primary is made of several turns of copper tubing and is inside the secondary, which is a hollow shell of sheet copper. Both primary and secondary are water cooled. Diagram, Fig. 15, shows a transformer with work coil, connected to a high frequency oscillator.

At the same time the current is stepped up by this transformer, the voltage is also stepped down which is another very important advantage. The voltage across the secondary terminals is so low that the work coil may be grounded at some point. Since the part being heated is usually at ground potential, the work coil may be coupled very closely to the part. Clearances as small as 0.030-in. or less, between coil and work, are permissible. Such close coupling makes it possible to concentrate nearly the full output of an oscillator into a very small area. This, of course, means extremely fast heating of the surface area directly exposed to the coil. Proper use of this fast heating permits localized hardening to a degree not possible without a transformer.

Progressive Hardening: Use of high frequency transformers for rapid heating of a very small area opens another field to induction heating; that of progressively hardening parts too large in both surface area and mass to be treated at one time by the amount of power available. Utilization of this method makes it possible to surface harden ways of lathe beds, the wearing surfaces on long bending dies, bearing surfaces on large shafts, outer surfaces of wrist and piston pins, as well as many other applications.

For hardening lathe beds and long bending or stamping dies, a hairpin coil, conforming closely to the contour of the part but looped away at sharp corners to prevent overheating, may be used. Note Figs. 14 and 19. Part to be hardened is moved progressively past, usually underneath, the coil which heats it to the required temperature. It is important to position the quench so the water strikes the heated portion immediately as it leaves the coil, Fig. 20, otherwise the heated area will begin to cool before the quench is applied, and uneven hardness may result. The more massive the part, the more critical the quench problem. For applications of this type, the clearance between coil and part may be as close as 0.030-in. Close coupling is necessary, since the coil scans the surface instead of surrounding it.

Hardness pattern obtained in an induction hardened part depends on coil design, frequency, power available, speed that part is moved relative to the coil, and metallurgical response of steel. Pattern shown in Fig. 14 resulted from the coil shown, operating at a speed of 10 fpm,and with an output of approximately 36 kw. In Fig. 19 the speed was 4 fpm and the power output 30 kw. SAE 1140 steel was used in both cases, and the rockwell C hardness of the hardened layer was 52 to 55. These parts were 12 to 16 ft long.

For long parts—with wider sections to be hardened—the speeds will be correspondingly lower. Successful hardening is done at speeds as low as 3 ipm. At very slow speeds, quenching becomes the limiting factor, because the heated area moves into the quench so slowly.

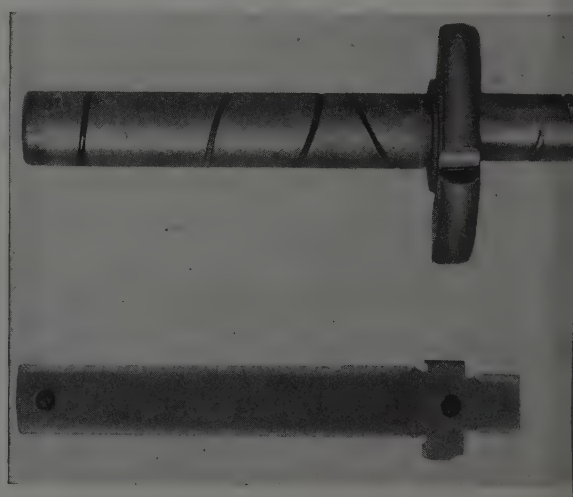
Cylindrically-shaped parts, such as shafts, rolls and pins up to 4 in. OD are surface hardened successfully by moving them through a high current inductor coil. Simplest way to handle parts of this type, unless they are too long, is to lower them at a constant speed through the heater coil, Fig. 13, into a tube-type quench immediately below the coil, Fig. 23. The water in the quench tube should be supplied in a manner described later in this article. Volume must be sufficient to carry the heat rapidly away from the part. The quench is much more likely to become a problem with large-diameter parts than small ones, because speed of movement is much slower for large parts.

Parts which can not be conveniently handled vertically may be run horizontally. This, however, makes the quench problem more difficult. A spray type quench ring is often used, but there is a tendency for some of the water to run back along the piece to the area which is still being heated. Obviously, such a condition results in nonuniform hardness.

For progressive hardening of pins several inches long and ranging in diameter from ⅛-in. to 1 in., automatic handling equipment is available. The unhardened pins are dumped into a hopper and need not be touched until they are taken from the quench tank. Fig. 21 shows the hardened case on a piston pin 3/4-in. in diameter with 1/8-in. wall thickness. This was done progressively at a speed of 0.63-in. per sec, with an output of 13 kw. It is interesting to note that although part of the pin has a thicker wall, the depth of case is uniform.

In all progressive hardening, care must be exercised to maintain constant clearance from coil to part. When hardening cylindrical pieces, failure to center accurately the part with respect to the magnetic field set up by the coil results in a case which is thin on one side and deep on the other. This could, of course, be eliminated by rotating the part, but such a fixture, together with the device for moving the piece through the coil, becomes quite expensive. However, use of accurate guides give excellent results without rotation.

Fig. 18 is a view of an eccentric shaft, and an etched section of the shaft after being hardened progressively on an electronic heater rated at 15 kw output. The long end of the shaft was hardened progressively at a speed of 0.275-in. per sec, and the short end, slightly smaller in diameter, at a speed of 0.46-in. per sec. Depth of case for both ends was approximately 1/16-in., and the hardness was 56-60 rockwell C. The shaft was made of SAE 1140 steel. At the beginning of the heat cycle, the shaft



as held stationary for a short interval to permit the surce directly opposite the coil to come up to hardening mperature. If motion of the piece was started simulneously with application of power, the hardness pattern ould not extend the full length of the shaft. In prouction, entire heat cycle is controlled automatically to sure uniform results.

Quench Fixture Design: Fast, uniform quenching of duction heated samples is of great importance where in, uniformly hard cases are desired. In fact, in many ardening applications, the quench problem for a specific art often is more difficult to solve than that of heating. When the surface of a part being heated by induction 500 kilocycles per second is raised to the hardening mperature in two or three seconds or less, the depth which this temperature extends is quite shallow, posbly 0.010 to 0.030-in. Conduction of heat into the uneated portion will be very fast. Unless the part is uenched quickly, the surface may drop below the temperture required for hardening before quenching medium is pplied. Immediate application of the quench at the end

Fig. 19 — Female bending die with inductor coil in position for progressive hardening operation

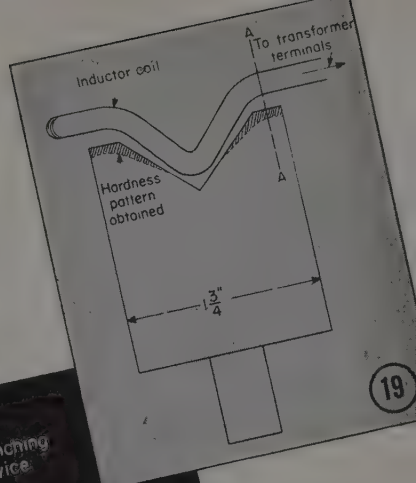


Fig. 20—Section A-A, Fig. 19, to show position of quenching device with respect to coil and part being hardened

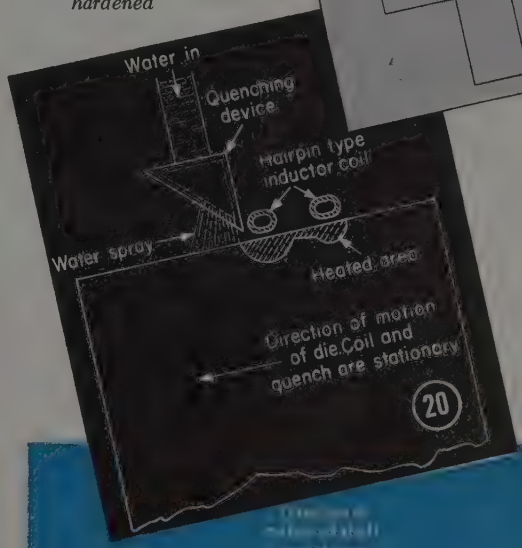


Fig. 18—Eccentric shaft and longitudinal section etched to show hardness pattern resulting from progressive hardening. Steel 4140; hardness, 55-60 rockwell C

Fig. 21—Longitudinal section through a progressively hardened piston pin etched to show uniformity of depth of hardened area. Pin is 3/4-in. OD, with minimum wall thickness of 1/8-in. Note thicker wall did not change case depth. Steel was 1050; power into pin, 13 kw; speed of progression of pin, 0.63-in. per sec; frequency, 525 kc; hardness at surface of pin, 60-62 rockwell C x 2

Fig. 22—High-frequency current transformer with single-turn secondary and ten-turn primary

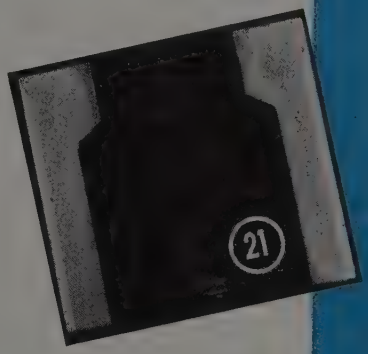
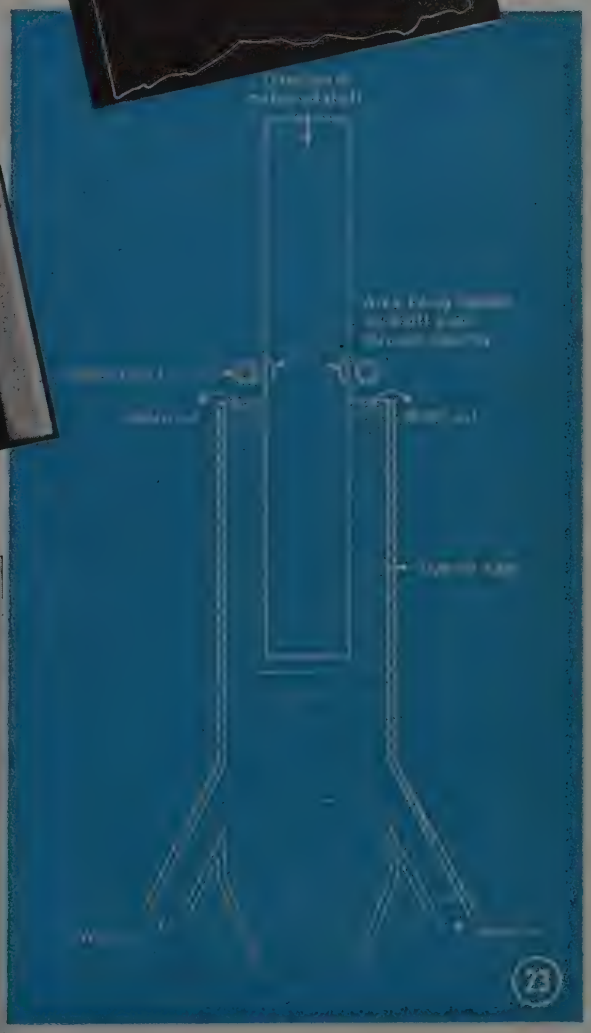
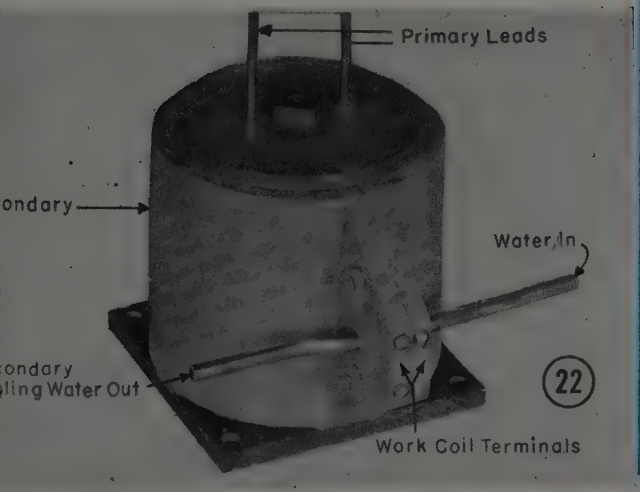


Fig. 23—Setup for progressively hardening surface of a shaft. Depth of case may be controlled by varying speed of movement of the shaft. Current transformer is used to provide high current in inductor coil





of the heat cycle, however, is not the only consideration. It must be uniform, so the entire heated surface cools at the same rate. Sufficient volume of the quenching medium to provide rapid cooling is of course essential.

Quenching Mediums: For induction hardening, water is the most commonly used quenching medium and is preferred because it is clean and easily handled. If large volumes are required for certain applications, it can be cooled and recirculated to avoid waste.

In some applications where special steels are required, a water quench may be too severe and cause cracking. In such cases oil may be used, although it is somewhat messy. Quick, complete immersion of the heated part is necessary to avoid smoke and possible ignition of the oil.

Another method of eliminating cracking resulting from quenching with water is to limit the quench cycle so the part is not cooled completely. If quench time is controlled so the part comes out at, for example 200 to 315° C, there will be enough heat left in the part to have some drawing effect as it cools slowly in air. Correct cycle usually can be worked out experimentally by trial and error method. This method is not a cure-all for cracking troubles, but it is successful in many cases. Properly applied, this self-draw may eliminate a furnace draw, thus cutting out an extra operation. Also, parts come out dry. This saves drying or possibly oiling to prevent rust formation.

Types of Quench Fixtures: Many different devices are designed for quenching induction heated parts. Since they are usually placed close to the inductor coil, they are usually of copper or brass. These materials are easily fabricated, and being nonmagnetic, can be located closer to the part being treated than a similar fixture made of a magnetic material. Plastics are sometimes used, but die costs are high. Unless a quench ring or fixture is a standard item, the cost may be prohibitive.

Although quench fixtures take a wide variety of shapes and sizes, most of them fall in one or more of the following classifications: Spray, nozzle, tank or tube.

Spray Quench: A spray quench of the type shown in Fig. 3 STEEL, Jan 13, p. 79) is frequently used. It generally surrounds the coil so that the water actually sprays between the turns of the coil in order to quench the part that was heated. Such a quench provides a uniform supply of water to the entire surface of the heated part. The spray quench can be adapted to many shapes and sizes to fit a wide range of hardening applications. Note Fig. 16.

In using this type of quench, it is necessary to guard against the holes becoming plugged with dirt and causing uneven distribution of water. Inductor coil supports must be carefully designed to provide a minimum barrier between quench ring and heated part, since a wide or massive coil support may obstruct the water spray sufficiently to cause soft spots.

Nozzle Quench: The use of one or more nozzles, Fig. 17, to direct the quench water is often convenient in applications where the geometry of the part being hardened and the holding fixture make use of a spray difficult.

Another application of the nozzle quench is that of selective quenching. It may be desirable to harden one side of a part and not the other, but it may not be possible to heat just the surface where the hardness is required. The problem sometimes may be solved by designing a coil which heats more than the area where hardness is specified and then using a nozzle to direct the water to quench the desired area. The surface which received the direct stream will quench out quickly, while the remainder of the part will cool much more slowly, and with little or no resultant hardness.

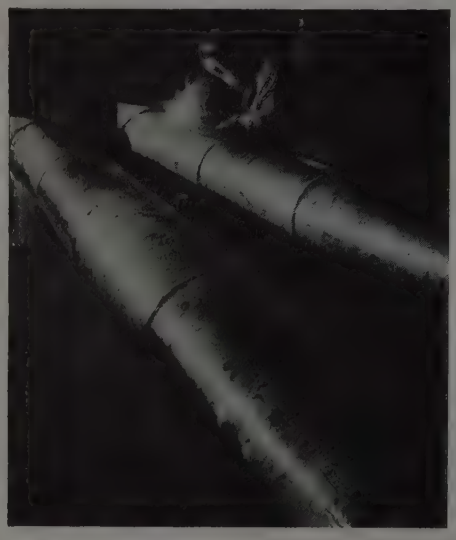
Tank Quench: Tank quenching is familiar to everyone who has done heat treating. The water, or oil, must, of course, be kept in motion to avoid formation of bubbles around the heated area. In the continuous handling of small parts for induction hardening, a simple method for quenching is to have the parts dropped automatically into a quench tank at the end of the heat cycle. A conveyor belt in the bottom of the tank carries the parts to the top of the tank and discharges them.

If physical limitations keep the tank shallow, parts may still be at red heat when they reach the conveyor. The result may be spotty hardness.

An adaptation of the tube quench in combination with the tank quench may correct this trouble. It will retard the rate of fall of the part and will quench it faster because of the upsweep of water past the part.

Tube Quench: The tube quench is exactly what the name implies. Fig. 19 illustrates the use of the tube quench in a typical progressive hardening operation. Note that water inlets direct the water upward, and that bottom of the tube is restricted so the water will flow out over the top edge of the tube. Due to surface tension and the upward flow, the water will actually pile up at the top of the tube. This makes it easy to get the water level very close to the coil without splashing water up into the coil, as would be the case with a spray quench held equally close. The uniform upsweeping wall of water surrounding the heated part as it moves into the quench assures fast, even cooling. This type of quench is easily adapted to automatic handling of shafts, wrist or piston pins, sleeves and similar handling objects.

(To be continued)



STAINLESS STACKS: These twin 80-ft exhaust stacks made of 18-8 stainless steel sheet were designed and fabricated for a dye works where it was necessary to dissipate acid fumes. Stacks were constructed by first rolling the sheets and welding them longitudinally. The rolled sheets were then welded into sections using Air Reduction Sales Co.'s Airco 19-9 stainless steel electrodes

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[9] G. Babat, "Construction of Heating Coils for Induction Surface Hardening", Heat Treatment and Forging, January to April, 1941.

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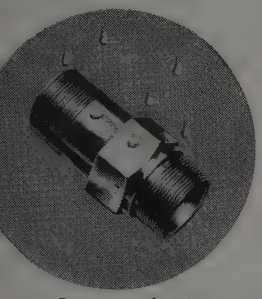

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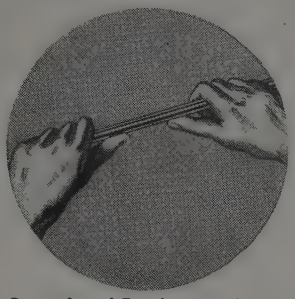

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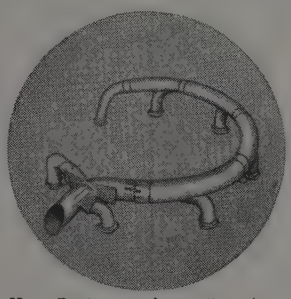

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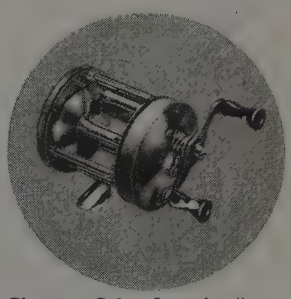

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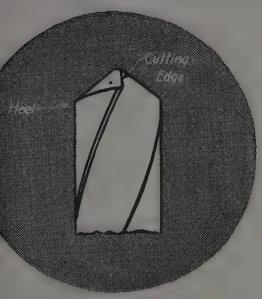

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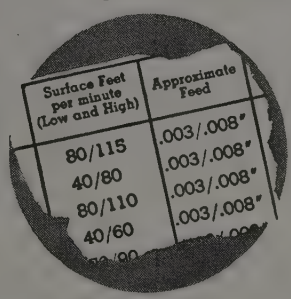

Surface Feet per minute (Low and High)	Approximate Feed
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40/80	.003/.008"
80/110	.003/.008"
40/60	.003/.008"

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. . . in one pass at 4000 feet per minute

View shows the huge 5-stand, 4-high cold reduction mill in the United Engineering Youngstown plant where it was tested

COLD strip 0.10 to 0.125-in. thick by 36-in. wide is reduced in one pass by a cold reduction mill recently constructed and tested for an undisclosed purchaser by the Youngstown plant of United Engineering & Foundry Co. The strip leaves the last stand of the mill, reported among the largest units built for the steel industry, at speeds up to 4000 fpm. Cold strip up to 52 in. wide in all commercial gages also is rolled by the mill. Capacity of the cold reduction unit is nearly 60 tons of tinplate per hour.

Strip is brought to the mill, shown in the accompanying view, in loose wound coils with an outside diameter up to 60 in. and weighing as much as 30,000 lb each. Each of the coils after rolling, produces a strip of metal 24,600 ft or 4.7 miles long. This leaves the mill as a tightly wound coil, involving no manual labor, in little less than 6½ min.

Work rolls of the mill are solid steel forgings 21 in. OD by 56 in. long; they are mounted in Timken tapered roller bearings, and each pair of rolls is driven by motors of 1500 to 4000 hp. To carry tremendous loads necessary to reduce the strip, each work roll is supported by a roll 53 in. diameter by 55 in. long; it is carried in oil-flooded sleeve type bearings capable of operating under a load of 5,700,000 lb per roll. The rolls are carried in massive steel castings, two per roll stand, or 10 in all. Each of the castings is 23 ft high, 9 ft 8 in. wide, and weighs 215,000 lb.

To adjust opening between work rolls in each stand, each roll housing carries a 50 hp motor and gear drive attached to a screw. Two screwdown motors of each roll stand are connected together by a magnetic clutch, so that the pass opening may be increased or decreased uniformly; or by disengaging the clutch, either end of the roll may be adjusted independently to correct the gage of the strip across the width. Hydraulic cylinders actuated from a 1500 psi accumulator system are located in the roll bearing chucks to take up all the slack in the roll stand. They also provide a maximum opening between the work rolls to facilitate entrance of strip into each roll stand.

To insure finished strip of uniform gage, tensiometers between the roll stand regulate the mill motors' speeds, and control the tension in the strip between roll stands. Flying micrometers provide the operator with a true picture of the strip thickness over its entire length.

As the strip leaves the last roll stand it is guided into a drum by means of a belt wrapper which is held in contact with the reel by an air cylinder. Thus much mill time is saved since this device makes it unnecessary to stop the mill while the strip is fed into a strip gripper on the reel drum by hand. The reel is driven by an 800-hp motor provided with a constant tension control. This permits winding the strip under any preselected tension.

After strip is coiled, a hydraulic cylinder collapses the reel drum so the strip may be removed easily by a hydraulically-operated stripper. Latter is equipped with a hydraulically-elevated coil carriage which may be adjusted to match exactly the outside diameter of the finished coil. The coil carriage is arranged so it automatically discharges the finished coil to a scale which in turn automatically weighs and records the weight.

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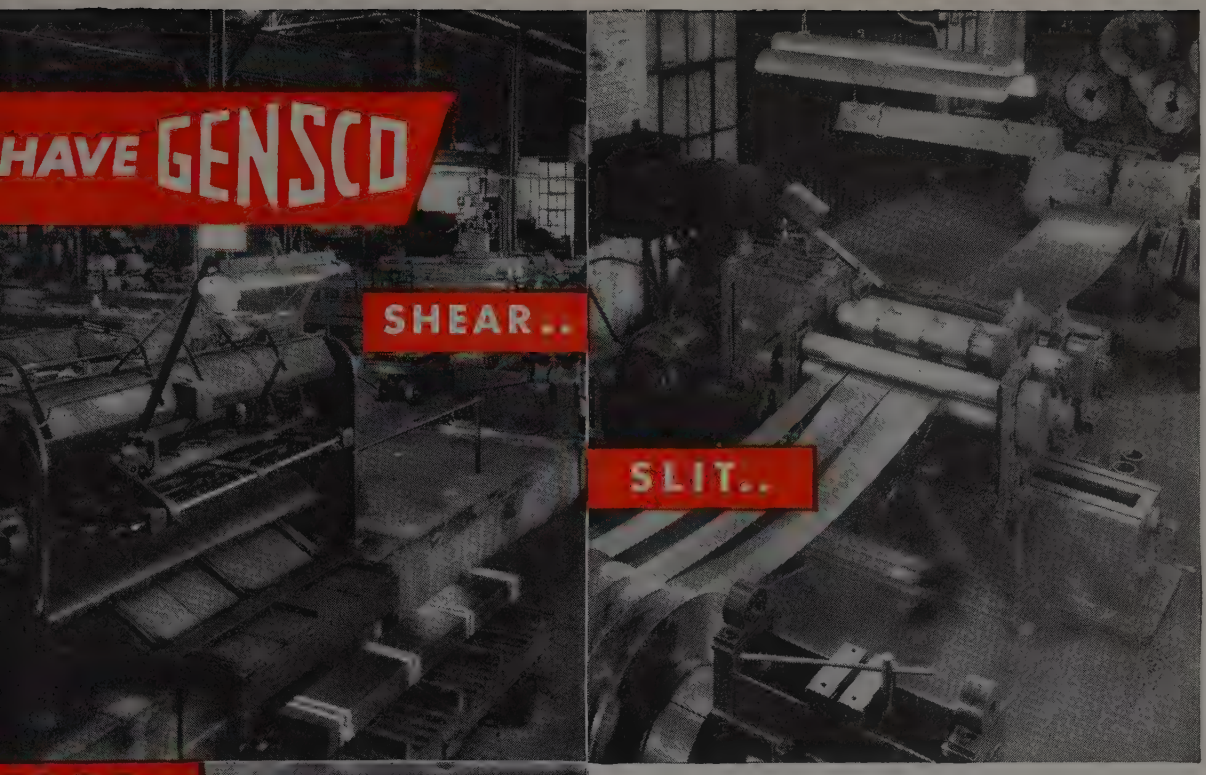
Reported as one of the most satisfactory rods for work involving poor fit-up on mild steel, the No. 107 electrode developed by Wilson Welder & Metals Co., New York, is recommended for single or multiple pass welding on rusty or dirty plates or sections, and works equally well on straight or reversed polarity direct current or alternating current.

Electrode can be used with abnormally high welding current, has a high deposition rate and permits use of "dragging technique." It conforms to E-60 classification of American Welding Society specification A233-45T and is marked in accordance with NEMA standards.



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APPLICATION OF

Statistical Methods IN INDUSTRY

Tabulating system provides periodic summaries of daily control reports as well as data for plotting frequency distributions, control charts and moving averages and summaries by numerous subclassifications. Single and double sampling plans on lot inspection of incoming and outgoing material finding wider use

By W. T. ROGERS
Metallurgical Statistician
National Tube Co.
Lorain, Ohio

PRACTICAL operating and mill supervisors are viewing with apprehension a development which includes in its explanatory title the word statistics—all because of a certain stigma attached to the word. The statistical methods in industry, however, imply the application of fundamentally sound and scientifically proved methods which have long been used by scientists in other fields and which have recently been adapted to industrial quality and production control. There is no doubt that the most significant recent development in this field is the breaking down of this apprehensive attitude and the almost unanimous reversal of sentiment with regard to this branch of statistics.

It is not meant, by the foregoing statement, that the change in attitude was a spontaneous conversion on the part of industrial management. It is rather the normal consequence of the pioneering effort of a few men who had the firm conviction that they had discovered a new application of the science of numbers. For some 20 or 30 years a small number of hard working, learned men have been persistently pushing these methods against an indifferent attitude on the part of production engineers. Shortly after the beginning of World War II industrial management reached a point where, with every wheel turning and every man working, there was still a demand for more and more material to prosecute the war. The time was ripe for these pioneers to step in, and with the methods already developed and the demand for their use at hand they proceeded to show what could be done, and this was the main reason that their methods have been accepted with confidence.

During the recent war the War Production Board in conjunction with the American Standards Association set up and manned an intensive training course all over the United States in which production engineers, particularly in inspection processes, were taught the fundamentals of sample inspection. This training and the subsequent application of the methods taught opened up the inspection bottleneck on many manufactured articles of vital importance to the war effort. That these applications were fundamentally sound and not merely expedients in time of greatest need is attested by the fact that many reconverted manufacturing companies are incorporating them in their peace time production program.

Another development is the direct result of this intensive training program. As educators in engineering schools became conscious of the number and type of men and industries who were interested in this field they sought ways and means of incorporating this type of training in their own schools. Many schools now give this type of training as a part of their regular engineering curriculum and many more have it available in the form of special extracurricular courses. Thus the recent development expedited by the war effort is assured of further advancement by this means.

With reference to specific applications, recent developments show increased use of single and double sampling plans on lot inspection of incoming and outgoing material. The increased emphasis which is also being placed on sequential analysis is an added development which cannot be overlooked. Process inspection on repetitive operations is constantly finding new advocates and is showing economies commensurate with the time and effort spent in its installation.

In large wholly integrated plants, such as steel mills, the control chart method had been expanded to include the control of variables in the coke plant, blast furnace, bessemer converter, rolling mills and finishing mills. In addition, the control of accidents, manhours, efficiency and production are all being attacked by the statistical control method. These applications are recent developments which promise to be permanent. Applications of correlation methods such as bivariate and multivariate correlation, analysis of variance and factor analysis show an expanding use and are producing satisfactory results.

In large industries the amount of data which must be handled in order to apply statistical control methods is a major problem and has been one of the chief objections to the use of statistics. This has recently been overcome in a number of plants with the use of the punch card tabulating system. One large steel plant handles practically all of its metallurgical control data in this manner. It is possible by this means to secure a large proportion of the necessary daily control reports directly from the tabulating machines and periodic summaries are available at only a fraction of the cost in clerical labor. In fact, many desirable reports which would otherwise be prohibitive, due to the cost of summarizing, are made available in this manner. Data for the plotting of frequency distributions, control charts, moving averages and summaries by numerous subclassifications are readily obtained with ease and speed from tabulating equipment. The laborious calculations necessary in working out multiple correlation problems may now be obtained directly from tabulating machines. This is a great step ahead for industrial statistics and those who are using it find themselves accomplishing about ten times the work that was formerly done.

Another development which marks a great advancement in the use of statistical methods is the formation, within the past year, of a national society, "American Society for Quality Control". Through this national organization, with local chapters in most large industrial cities and nearly 2000 members, the users of statistical methods in industry will have a clearing house of information, comparable to other engineering societies.

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AUTOMATIC AND SEMIAUTOMATIC

In this final section of the series the author discusses some of the more dependable techniques now being employed in high speed production

Buffing and Polishing

By JOHN E. HYLER

SMALL grinding units, operating at 17,000 rpm are very effective with various types of tools mounted on special mandrels as well as with the permanently mounted grinding wheels and points. These high speed units were developed primarily for operations in tight spots impossible to get at with larger wheels.

Tools used in these machines include: Soft rubber polishing wheels 1/8-in. thick and 7/8-in. in diameter; soft rubber polishing tips that are capable of rough-polishing gems; felt wheels, some 1/8-in. thick, and from 5/8 to 1 in. in diameter, others 1/4-in. thick and 1 in. in diameter; cone-shaped felt polishing tips for delicate and intricate work; and even tiny rag buffs.

Another type of electrical tool much favored for intricate polishing in hard-to-get-at places transforms rotary drive into fast reciprocating cutting action. This tool, weighing less than 5 lb, is available in two different models, one of 1/8-in. stroke, the other of 3/8-in. stroke. It can be held in the hands and taken to work pieces on a bench, or it can be clamped in a bench stand, so that work pieces can be taken to it.

Various polishing accessories with different grits are provided. One holds strips of metal finishing cloth. Another is a block of abrasive rubber. These little reciprocating tools are particularly effective in tight places when equipped with abrasive blocks specially shaped to reach into tight places.

Pneumatic tools are in high favor where tough buffing jobs demand heavy pres-

Fig. 15 (top)—This cylindrical finishing machine is equipped with a special fixture for polishing U-joint shapes

Fig. 16 (left)—Automatic machine processing bearing races. Table carrying eight work-holding fixtures is automatically indexed through 45 degrees, stops, and work-holders revolve with work pieces in contact with polishing and buffing wheels. Table is then indexed another 45 degrees forward and cycle repeated. Photos courtesy Hammond Machinery Builders Inc.

on the wheel. Both pneumatic and able electric buffers are built with t angle heads so that the side of the is used. Manufacturers of heavy able electric and pneumatic tools in t cases include buffing units in their s. Remember also that buffing is one he main uses of many excellent flex-shaft outfits, manufacturers of which ally list buffing heads and buffs ng their attachments.

Manufacturers of abrasive cloth have eloped methods and devices for using cloth for polishing in tight places. e is an example of such ingenuity in shing small bores in metal parts and ing a small radius on the edge of the es—all in one operation. Pieces of asive cloth, measuring 1/4 x 1 in., e threaded, back to back, through the of an ordinary large darning needle. s "butterfly" tool was mounted in the ck of a high speed portable power . Whirling action threw the abrasive ngs" outward within the bores, thus g an effective polishing and "radius-" job.

One company developed grinding nts made up of multiple layers of asive cloth. Strips are of special shape, pped to produce points having noses slightly curved conical form. These nts are particularly useful for finishing ll concave areas with varying radii. y are used on a steel mandrel, having hread and pilot to fit a center hole. thread holds the device on the man- while the extended pilot prevents pping when the cone is revolved at h speed. These points can be mounted chucks of portable electric and pneu-ic tools as well as on flexible shaft s. They are employed as a follow-up r using rotary files, burring tools or unted points and wheels to remove tool marks.

Machines With Automatic Action: he automatic polishing and buffing chines are for those purposes only le on the other hand, automatic pol-ng and buffing are secondary func-s of machines that do automatic nding preliminary to buffing and shing. When contemplating installa-n of automatic machines, determine efully what work can be handled fitably in this manner. Also make e that there is sufficient quantity of h work to justify the installation.

f it turns out that an automatic can-logically be installed, it may be that production line system is in order. s will involve a row of ordinary pol-ng machines, each equipped with a eel suitable for one phase of the ration. The work pieces simply are nded down the line" from one operat-to the next, thus emerging completed the end of the line.

SCRAP DISPOSAL: Unique and economical method of scrap removal at Edward Valves Inc., East Chicago, Ind., uses a tilting dump body mounted on an ordinary 4-wheel truck to pick up scrap at points around the plant. When dump truck is full, a fork truck, shown here, made by Clark Tructractor division of Clark Equipment Co., Battle Creek, Mich., picks up truck, scrap and all and carries it to a truck trailer, kept standing for the purpose. The fork truck carries the load onto trailer, dumps scrap and returns the truck to be loaded again

Obviously, where an automatic machine is justified it does save a lot of manual labor. Design and setup of an automatic polisher and buffer should be adapted to the work in hand. An example of this is provision of sectional rotary magnetic chucks of large diameter which firmly hold flat work as it is traversed beneath a series of overhanging polishing wheels, then release it instantly at point of ejection.

Circular workpieces often lend themselves to effective polishing on semiautomatic machines. They are brought into contact with the polishing wheel, then rotated. Work is advanced or retracted so the polishing wheel gets at both high spots and hollows. Since the operator is relieved of much manual effort, he can attend to more than one machine.

Cylindrical polishing machines now are in general use on work from 1/4 to 9 in. in diameter and 12 in. or more in length. These machines hold work against a wide-faced 16 in. diameter wheel, rotate it and advance it horizontally across the wheel face—in a manner similar to centerless grinding. Another version is a belt-type centerless grinder and polisher. This handles cylindrical work in the smaller sizes, from 1/4 to 1 in. feeding it automatically. No centering or chucking operations are involved.

The rotary table principle for presenting small workpieces to a series of buffing and polishing wheels is applied by various builders of automatic machines. Some apply the Geneva indexing motion to tables having multiple work-holding chucks or spindles for disk, cylindrical or conical work of relatively small size. A number of polishing heads are arranged around the table periphery so that they register with points where the work-holding devices dwell after each step in indexing. When this dwell occurs, each work-holding chuck or spindle revolves its work-piece in contact with the wheel with which it "registers."

Some of these machines have polishing heads supported on brackets integral with the machine base. In other cases the heads are on individual floor bases arranged around the circular table unit to suit the work at hand. Metals and plastics are handled to advantage.

In connection with such machines the so-called "auto-doper" can be used effectively. This gives controlled, automatic applications of buffing composition while work goes on. One model accommodates sticks of compound of rectangular form only. Another handles round or cylindrical sticks. The latter is recommended only where narrow buffing wheels are used.

Plugs, pistons, small gears, etc., are a few of many products polished and buffed to advantage on machines of the foregoing types, which incidentally may be had in many different sizes. As a general rule, work-holding chucks on automatic indexing machines will take work up to 5 in. in diameter. The setup usually provides that two or three of the work-holding chucks or spindles cease revolving as they come into the unloading and loading zone. This makes it

easy for an operator to unload and load work while the machine is in full operation.

Six to eight chucks or spindles are the rule. The number of wheel heads depends on the work to be done. Burring and brushing as well as polishing and buffing, can be carried out. The usual arrangement is to have the work-holding chucks or spindles vertical but in some cases they are positioned horizontally. Output of 30 or more pieces per minute, fully polished and buffed, is not unusual when conditions are favorable. In one machine developed especially for polishing and buffing flatiron bases, workholding platens are arranged in radial slideways on the indexing table top. At "dwell point" these platens are reciprocated under the polishing wheels.

For straight, narrow and approximately flat work in quantity lots, straight line automatic buffers and polishers are recommended. These usually embody some sort of straight conveyor unit on which workpieces are mounted in successive chucks in which they are carried under a series of polishing heads which overhang the conveyor in operational order. Work need not be completely flat since polishing heads automatically can be lifted and lowered by cams designed to keep wheels in proper contact with slightly curved or slightly irregular outlines throughout each pass. Automobile bumpers are handled on this type of automatic polisher and buffer. One such machine is equipped with a conveyor belt traveling horizontally under ten individually motored polishing heads carrying wheels ranging from 10 to 16 in. in diameter. The "feedworks" is oscillated from side to side so as to prevent straight-line scratches or polishing marks.

Some automatic buffing and polishing machines are arranged to hold single workpieces, such as aluminum pots, pans and kitchenware, on the end of a horizontal spindle which rotates work against wheel. Others have as many as eight spindle-type work holders. These protrude horizontally in circular formation from a work-carrier which revolves on a central shaft. This setup brings bored cylindrical parts successively into contact with a wheel which polishes outside surfaces. The foregoing represent only a few of many types, engineered in many cases to suit individual jobs, on the basis of careful analysis.

Sheet Polishing: Polishing of sheet stock ordinarily is accomplished in a "planer-type" machine in which a traveling table traverses the sheet back and forth under the abrasive element. Some of the machines employ wide rolls made up by pressing large-diameter sewed buffs on a central shaft of large diameter. These rolls are set up with abrasive, repeated applications being made until a deposit about 1/4-in. thick has been built up. Rolls then must be carefully trued up before use. This generally is done by mounting them between centers in an old engine lathe and dressing them down with an abrasive brick, held and traversed in the toolpost on the carriage.

Other sheet polishing machines employ the traveling table in connection with an abrasive belt arrangement. The polishing head, overhanging the reciprocating table, has a series of pulleys carrying a belt slightly wider than the material being polished. The "contact pulley" which presses the fast-running belt down upon the reciprocating sheet stock, must have sufficient resilience so that the belt is pressed into full contact with the stock. Removable rubber-covered pressure rolls are used successfully, these being selected to give the degree of cushioning effect which the work requires.

Out-of-the-ordinary machines are exemplified by one employing a flexible abrasive belt for grinding and polishing interiors of tubes. Any tube having inside diameter of 5/8-in. or over thus can be finished perfectly smooth inside. The belt is passed through the tube and its ends are connected. As the belt runs within the tube pressure is applied to the back of it by means of a hollow floating rod fitted with an expanding head. This head is expanded by compressed air conducted through the hollow rod.

Another fairly recent development is a special abrasive head made up of a gang of radially-disposed brushes placed so closely together as to provide a full circle of brush bristle ends. There are 32 of these brushes. Out from each brush interface a strand of magazine-held abrasive cloth passes. This cloth has slashed or shredded ends. The yielding action of the brushes causes the abrasive to follow naturally over curves and into corners as irregularly-shaped work is brought into contact. For clean-up work in preparation for final polishing and buffing operations on various kinds of irregular work, this is one of the most effective abrasive elements introduced up to the present time.

These articles lay no claim to being encyclopedic. However, it is hoped that they do serve to focus attention on some of the improved machines and methods in a field wherein there still are wonderful opportunities. Machine designers, production engineers, tool engineers and abrasive specialists have a continuing responsibility here to exercise ingenuity to the mutual benefit of workers, management and the public which buys the finished products.

—o—

Practical heat treating tips and suggestions are demonstrated in two "Heat Treating Hints" movies recently produced by Lindberg Engineering Co., Chicago. The 16 mm, full color films run 48 and 38 min, respectively.

NEUTRON DEMONSTRATION: Using a $20,000 pellet of radium-beryllium, Dr. John R. Dunning, world authority on nuclear physics, illustrated the splitting of U-235 by slow and fast neutrons by bell ringing, flashing lights and the greenish electron trace on the face of a 20 in. cathode-ray tube. Dr. Dunning presented his famous Columbia University lecture before a meeting of the New York section of the American Industrial Radium and X-ray Society. Photo courtesy North American Philips Co. Inc.

EFFECT OF ACCELERATED ATMOSPHERIC CONDITIONS ON Magnesium and its Alloys

MANY manufacturers in the past tated to use magnesium and its ys in their products because of a espread feeling that these metals ld have poor resistance to corrosion. investigation was undertaken to de- ine, by the use of accelerated tests, corrosion resistance of commercially e magnesium, and the magnesium ys AZ31X, AZ61X and M-1 under following types of service conditions: nd indoor atmospheric; inland out- atmospheric; marine atmospheric. mical composition of the samples d is given in Table II.

amples which were to be exposed ccelerated inland indoor conditions e placed in a humidity cabinet which built to the D. N. D. Specification and which is rather similar to the described in U. S. Army-Navy cification AN-H-31.

uring the investigation the tempera- of the specimens was maintained at ± 1° C and the relative humidity 00 per cent. Pure air moved vertic- past the samples at a velocity of 8 ar feet per hour and the rack from ch the samples were suspended was ted at 1/3 rpm. There was a slight unt of moisture condensation on the aces of the samples. The test lasted days.

amples which were to be exposed to elerated inland outdoor conditions e placed on the inside wall of a re- ing metal drum. They were insulated n the drum by means of Tygon tape plasticized polyvinyl chloride plas- An electric arc using special car- electrodes was located at the center he drum. This arc furnished the heat ired for the test. For 3 min out of y 20 the metal samples were sub- ed to a spray of ordinary tap water. y became dry during the other 17 Ordinary uncontaminated air was l. Its temperature was approximately C throughout the test which lasted days of actual running time.

he samples which were to be exposed ccelerated marine atmospheric con- ns were placed in a type CA salt y cabinet, manufactured by the In- dustrial Filter & Pump Mfg. Co. A 20 per cent aqueous solution of sodium chloride, maintained at a pH of 6.8 to 7.1 with sodium hydroxide, was used for the spray. The temperature was maintained at 35° ± 1.5° C and the test lasted from 24 to 80 days, depending on the corrosion resistance of the metal.

Average corrosion rates of the various metals in the different tests are given in Table I. It should be noted that each value given in the table is the average of the results obtained from six different samples. On the basis of the conditions of the tests, the numerical results and the appearance of the specimens after the test, the following conclusions may be drawn:

All of the bare metals tested may be expected to withstand satisfactorily the corrosive influences which exist under inland indoor atmospheric conditions where the air is uncontaminated. All of the bare metals tested may be expected to withstand satisfactorily the corrosive influences which exist under inland outdoor atmosphere conditons where the metals are exposed to uncontaminated air, are wet by rain and are dried soon after each wetting.

The bare metals tested cannot be recommended to withstand the corrosive influences which exist under marine atmospheric conditions where they are exposed to the action of salt water spray; ordinary bare steel also deteriorates rapidly under such conditions.

Pure magnesium and the AZ31X and AZ61X alloys have been found in our laboratories to withstand the action of salt solution when properly coated with special paint. So far, under these conditions, the painted M-1 alloy has proved to be less satisfactory than the painted AZ31X and AZ61X alloys. In the meantime, a search is being made for magnesium alloy which resist marine atmospheric conditions.

From the paper "Corrosion Resistance of Magnesium and Certain of Its Alloys Under Various Accelerated Atmospheric Conditions", presented by R. R. Rogers, D. A. Tetu, and H. Livingstone, Bureau of Mines, Department of Mines and Resources, Ottawa, Canada, before the 90th general meeting of the Electrochemical Society.

TABLE I
CORROSION RATES OF MAGNESIUM AND MAGNESIUM ALLOYS UNDER DIFFERENT ACCELERATED ATMOSPHERIC CONDITIONS

Metal	Average Accelerated Corrosion Rate (mg./dm.²/day) Inland Indoor Atmosphere	Inland Outdoor Atmosphere	Marine Atmosphere
AZ31X Alloy	0.14	0.71	56.5
	0.15	0.75	33.7
	0.17	0.65	64.2
AZ61X Alloy	0.17	0.96	31.1
	0.29	1.10	9.0
	0.30	1.01	44.2
M-1 Alloy	0.69	0.56	20.8
	0.83	0.67	20.7
	0.75	0.61	19.9
Pure Magnesium	0.34	0.74	6.9

TABLE II
COMPOSITION OF PURE MAGNESIUM AND MAGNESIUM ALLOYS

Metal	Composition Al %	Mn %	Zn %	Fe %	Si %	Cu %	Pb %	Sn %	Cd %	Ca %	Ni %
1X	2.68	0.51	1.05	0.001	0.005	0.001	0.004—	0.002	N. d.	0.006—	0.001—
Alloy	2.97	0.48	0.99	0.001	0.003	0.003	0.004	0.003	N. d.	0.16	0.001—
	2.96	0.77	1.13	0.001	0.007	0.003	0.004—	0.002	N. d.	0.09	0.001—
1X	6.03	0.48	0.70	0.003	0.006	0.002	0.004—	0.002—	0.001—	0.006—	0.001—
Alloy	7.08	0.32	0.82	0.001	0.004	0.002	0.004—	0.002—	0.001—	0.006—	0.001—
	6.90	0.63	0.95	0.001	0.009	0.002	0.004—	0.002—	0.001—	0.09	0.001—
	N. d.	1.95	N. d.	0.002	0.003	0.001	0.004—	0.002—	N. d.	0.006—	0.001—
Alloy	N. d.	1.49	N. d.	0.018	0.005	0.005	0.007	0.002—	N. d.	0.12	0.001—
	N. d.	1.56	N. d.	0.013	0.003	0.003	0.004—	0.002—	N. d.	0.17	0.001—
nesium	N. d.	0.006	N. d.	0.0015	0.002	0.001	0.003	0.002—	N. d.	0.006—	0.001—

N. d. = Not detected. 0.004— = Less than 0.004; 0.002— = Less than 0.002; etc.

First National MATERIALS Convention

Exhibits at last week's Cleveland show included latest equipment and methods for reducing manufacturing costs by efficient movement of raw materials and products. Industries represented included iron and steel, warehousing, aircraft, automotive, electrical and railroad

EZRA W. CLARK
Vice President and General Manager
Clark Tructractor Div.
Clark Equipment Co.
Battle Creek, Mich.

WITH labor costs—both of skilled and unskilled varieties at an all-time high, with demands for products—both capital goods and consumer goods—literally swamping the manufacturing plants of America, production machinery should be in useful operation every minute of every working day.

That condition is possible only if materials constantly are fed to the production machines and constantly moved on to successive operations. It is possible, with adequate profit and with friendly labor relations, only if the highly paid operators are relieved of every possible yeoman service other than actual operative duties, and if delivery of materials not only is expedited but also is accomplished with minimum cost and minimum physical effort.

In other words, one of the most important—if not *the* most important question today throughout industrial America is this: "Are materials handling methods all that they should be in view of the new techniques and new equipment lately developed and perfected for moving, lifting, loading and stacking an almost infinite variety of raw and finished products?"

Seeking their own respective answers to that big question, thousands of men of industry visited Cleveland's Public Auditorium during the period of January 14-17, to attend the National Materials Handling Exposition, the concurrent Conference on Materials Handling, and the extensive showing of films dealing with practical application of the latest equipment and methods sponsored by leaders in the field.

The overall impression gained by a quick survey of the nearly 120 exhibits was that tremendous developments in the "moving" of materials have been overlooked lately because of concentration on the part of too many executives on developments in high speed "machining" of materials. If for no other reason than to readjust the balance in executive thinking, this exhibition was most timely.

Ingenuity in design of every variety of static, rolling, hoisting and lifting type of mechanism is such that the ever-present reaction was: "Why didn't someone think of that before?" The fact remains that it had not been thought of before, and so men had been going on struggling with tasks that these mechanical devices not only do infinitely faster but also infinitely more efficiently and safely.

As one of the leading figures in the automotive industry remarked during the recent SAE meeting in Detroit: "Work in a manufacturing plant no longer can be called *hard work*, provided that every possible provision is made for mechanical handling. If such provisions are not made, then unsatisfactory profits and bad employer-employee relations are only to be expected!"

Endorsed by five major trade associations, the first exposition devoted exclusively to problems relating to lowering industrial costs through more efficient materials handling can be considered a big success even by the most critical convention-goer.

With approximately 120 companies participating, the National Materials Handling Exposition featured displays of equipment built to serve many industries including iron and steel, warehousing, aircraft, automotive and railroad. Morning and afternoon panel discussions on materials handling, led by executives drawn from a cross section of industry were conducted concurrently with the exposition.

Heading a list of forty industrial leaders, C. M. White, president, Republic Steel Corp., Cleveland, spoke on "Industry's Hidden Cost: Materials Handling." Ezra W. Clark, vice president and general manager of Clark Tructractor division, Clark Equipment Co., Battle Creek, Mich., and chairman of the program committee, presided over the opening session. Government progress toward standardization of materials handling equipment was discussed by W. E. Braithwaite of the division of simplified practice, National Bureau of Standards, Department of Commerce.

According to Mr. Clark, a careful survey of American industry indicates that 80 per cent of unskilled labor in industrial plants is used to move things

HANDLING
nd Exposition

C. M. WHITE
President
Republic Steel Corp.
Cleveland

dding nothing to a product except
. Management must move toward a
ductive economy where there is a
ater percentage of skilled labor no
ter how great the wage and a smaller
centage of unskilled labor, which is
essively expensive no matter how
ll its wage.

n stating the National Bureau of
ndards' aims, Mr. Braithwaite ex-
ned that the immediate objective is
abandon all odd and unnecessary
ns and to concentrate on a simplified
that will meet all requirements
nout clogging the machinery of dis-
ution and slowing down the rate
urnover.

On Wednesday morning, Jan. 15, C. F. Kells, director of education, Electric Industrial Truck Association, Pittsburgh, presided. E. J. Mills, transportation supervisor, Pittsfield Apparatus Works, General Electric Co., Pittsfield, Mass., spoke on centralized control of materials handling.

R. F. Weber, in charge of research for materials handling and product protection, International Harvester Co., Chicago, discussed "Research in Materials Handling". Some of the advantages of a well-planned research program, mentioned by Mr. Weber were: Reduce cost of handling, economize warehouse and storage space, increase plant capacity, reduce inventory, improve product protection, reduce hazards of handling, improve working conditions, facilitate materials control, speed up delivery of product to consumer, develop standard practices, originate specifications and manuals for general usage.

E. I. Burke, manager of shipping, Republic Steel Corp., Cleveland, and chairman of the exposition's policy committee,

(*Please turn to Page* 102)

As the Show Progressed

AJOR feature of American Waresemen's Association's 56th annual conion held concurrently with the show a complete materials handling demration entitled "Machines at Work." me of the presentation was that no le type of materials handling equipt is best, that each has an important ction, and that a materials handling em must be "custom built" for each vidual company's operations.

he presentation occupied the entire dnesday afternoon program and inled a panel discussion "The Materials dling Revolution—an Introduction to dern Materials Handling Methods;" e demonstrations of equipment for etized and unpalletized operations; and an address by Col. Albert B. Drake, president, Drake, Startzman, Sheahan, Barclay Inc. entitled "The Distribution System of Tomorrow."

Principal speakers at the Warehouse convention were Dr. Harold Vagtborg, president of the Midwest Research Institute, Kansas City, and Merryle Stanley Rukeyser, New York, economist, radio commentator and columnist.

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BASED on the idea that unit loads of materials efficiently handled with electrical equipment are payloads and that such loads pay off in profits for management and upgrading for labor, a new movie entitled "Payloads Pay Off" received its world premiere in Cleveland last week.

Presented by the Institute of Visual Training, New York, and produced under a grant from Automatic Transportation Co., Chicago, the three-reel, 26-min. black-and-white sound picture includes visual study of actual operations, with detailed shots of the transportation control room and equipment at work at the General Electric Pittsfield, Mass. plant. It shows the latest type of material handling equipment and also the most advanced methods of using it.

The film is to be distributed through the facilities of both the Institute of Visual Training and Automatic Transportation Co.

NEW METHOD FOR BUILDING *Open-hearth Flues*

Application of refractory concrete saves time in laying up flues from checkers to stack and facilitates building streamline flues with continuously changing sections. Material costs reduced through use of salvaged materials. Article describes rebuilding job at shop in Pittsburgh district

CONSTRUCTION of open-hearth furnace flues with refractory concrete has resulted in notable savings in time and cost at the Donora Works of the American Steel & Wire Co. Donora, Pa. Three natural gas fired furnaces of 110-ton capacity have been equipped to date with the new type flues.

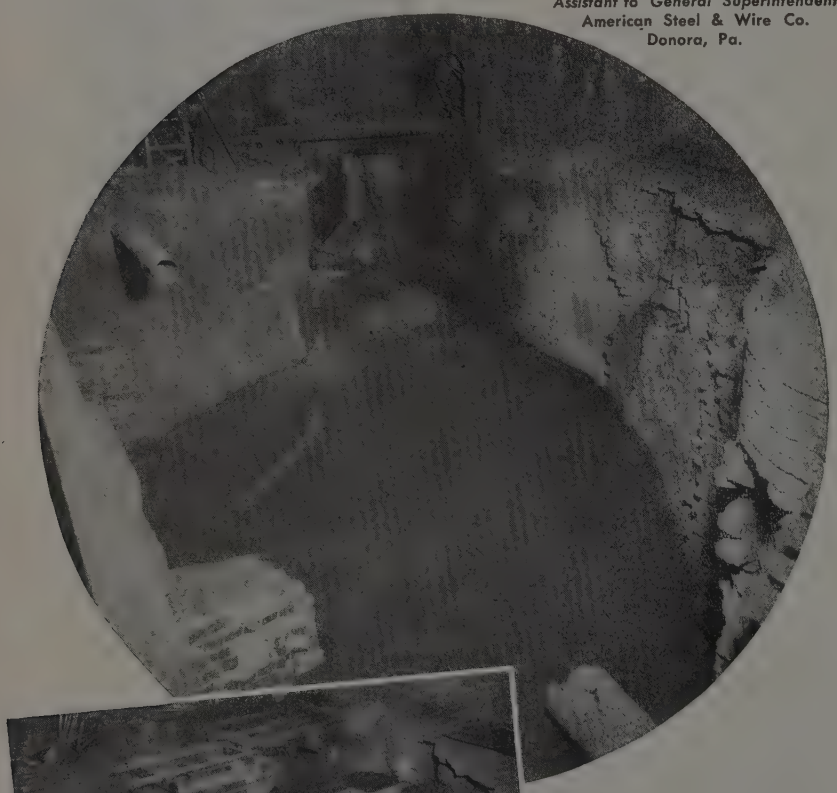
When it became necessary to rebuild the first furnaces, the need for war production limited construction time to a minimum. The old flues connecting the checker chambers to the stack were in poor condition, but time did not permit rebuilding both furnace and flues by the usual methods. Also, there was not enough mason labor available to handle the complete job. The engineering department studied the possibility of using refractory concrete, which proved to be favorable and as a result flues were redesigned and streamlined. Refractory concrete was found to be especially suitable for building flues with continuously changing sections in exact accordance with the new layout which had been determined on the basis of operating efficiency.

By W. F. CONLIN
Assistant to General Superintendent
American Steel & Wire Co.
Donora, Pa.

Experience gained from the first installation in 1943 led to the use of the same type of flue construction on a second furnace in September, 1945. A third open hearth was re-equipped in the same manner in August, 1946. Inspections have been made each time the furnaces have been off for repairs and no cracking other than superficial checking has been noted. The flues are normally exposed to temperatures of 1200 to 1300°F but occasional flashes due to secondary combustion may raise the temperature to 1800 to 1900°F for a few minutes.

Refractory concrete used in the three flue systems consisted of a mixture of 1 cu ft of Lumnite cement to 4 cu ft of crushed fireclay brick. The crushed firebrick ranged in size from 2-in. maximum to dust with 50 per cent passing an 8-mesh screen. The aggregate was prepared by crushing old firebrick from the company's pottery plant. An important requirement in preparing the aggregate is to maintain the specified percentage passing the 8-mesh screen. The relatively high percentage of fines was found to provide plasticity in the mix and is a factor in maintaining the strength of the concrete at higher temperatures.

The first step in construction was to



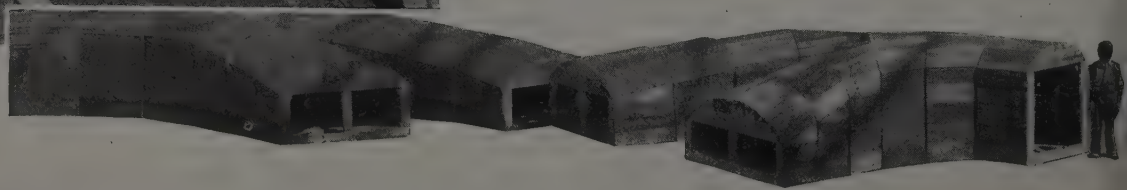


Fig. 1 (above, left)—Unreinforced base slab of open-hearth flue which runs from checkers to stack is made of refractory concrete, 9 in. thick

Fig. 2 (center, left)—Placing refractory concrete arches of flues from open-hearth checkers to stack

Fig. 3 (below)—Prefabricated wooden forms ready for erection on base slab before casting refractory concrete walls and arches

realign the trench walls after the old flues were torn out. Following the desired layout, the trench walls were built in the form of sweeping curves from the checkers to the stack. This eliminated the right-angle bends in the former flues. After leveling the floor of the trench, a 9-in. slab of refractory concrete was laid as a base. No reinforcing steel was used. The base was allowed to harden for 24 hours before the wall forms were erected. At the end of the 24-hour period, the base concrete had practically full service strength because of the rapid-hardening action of the Lumnite cement. Fig. 1 shows the base slab in place, the checker connections being under the railroad track on the left.

Prefabricated wooden forms were erected on the base slab and the flue walls and arch were then cast in place. No exterior forms were needed, as the sidewalls of the excavation had been straightened to allow for a nominal 12-in. thickness of flue wall. Again, no reinforcing steel was used. The arch tapered in thickness from 12 in. at the spring line to 9 in. at the crown. No expansion joints were used, and continuous placing of concrete eliminated need for construction joints.

The formwork, except for sidewall sheathing, was practically the same as that required for brick flues. Fig. 3 shows the wooden forms. These were built in sections approximately 5 ft long. This size of section simplified construction and provided for the constantly changing radius and span of arch.

The flues are 2 ft high at their connection to the checker chambers and have a span of 7½ ft. Their height at the point of merging is increased to 5½ ft and their span reduced to 5½ ft. This height is maintained in the final single flue, but the span is reduced to 4½ ft where it connects to the stack. As the stack is not centered with respect to the furnace, the outside length of the shorter set of flues is 32 ft, while the longer set is 40 ft from the checker connection to the stack.

Fig. 4 — Open-hearth flues built with refractory concrete. Top view shows flues on one side of furnace. Two flues from checkers (foreground) merge into single flue to stack

Changes in size of sections, radii and spans have a significant bearing on the economy of the job. With refractory concrete, no fitting and cutting of small units is necessary and special shapes are not required. Dimensioning was done by the form carpenter. It was found as easy to place concrete in the tapered and curved arches as in a straight sidewall. This is illustrated by the ease of constructing the tapered merging of the two flues from the checkers into the single flue leading to the stack.

Construction was simple and efficient. A 2-bag, portable concrete mixer mounted on a flat car was used. The refractory concrete was delivered by chute for the base slab. When that slab had hardened, the same equipment was used for mixing and placing the monolithic walls and arch. The car on which the mixer was mounted could be moved on a railroad track running parallel to the furnace, between the furnace and the stack. Behind this car was a railroad gondola loaded with the crushed firebrick aggregate. Because of the manpower shortage at the time, the complete job was handled by an outside contractor.

Final cost of the refractory concrete job was about 50 per cent of that estimated for other type flues. Several factors combined to effect the saving and to produce an efficient installation ready for service in scheduled time. The aggregate was salvaged material, prepared at small expense and the formwork was only slightly more elaborate than that needed for a conventional job. The Lumnite cement produced high-strength refractory concrete in 24 hours, so there was no delay in the successive concreting operations. The actual building of walls and arches was a simple matter of placing concrete, expedited by a carefully arranged mixing plant.

Results, as indicated by the present condition of the flues, have been entirely satisfactory. The oldest set of flues had been in service for more than three years at the time of the last inspection. Although the 1943 job at Donora is the first in which open-hearth flues were built with refractory concrete, the material had been used in a large number of furnaces, ovens, cooling pits and flues where service conditions are similar to those of the open-hearth furnace.

Editor's Note:
Additional data on Lumnite cement and its use at by-product coke ovens were presented in the Oct. 22, 1945 issue of STEEL, page 137.

Reversible Carbide File Used on Hardened Steels

New light weight reversible carbide file designed for lathe deburring or chamfering hardened steels at speeds of 450 fpm is available from Henry Disston & Sons Inc., Philadelphia. Supplied by Carboloy Co. Inc., Detroit, filing surface is one-piece single cut carbide insert 4 in. long by 3/4-in. wide with 34 teeth per in. The file's holder is made of aluminum.

According to the manufacturer carbide insert can be turned over when one face becomes worn. While file cannot be used for hand filing of metal, it may be used on molded plastics for hand filing of flat or convex surfaces.

Line of Automatic Electrodes Announced

With production line applications ranging from thin gage sheet metal forms to boilers, axle housings and torque tubes, a new group of automatic arc welding wires and tapes is offered by Air Reduction Sales Co., New York.

Embracing five knurled type wires and five tapes for flat position operation, line of electrodes is manufactured in several diameters for low cost, uniform, automatic welding, the company states.

Diamond Drill Fittings Standard Revised

Recommended revision TS-4269, of diamond core drill fittings (third edition), commercial standard CS17-42, prepared at the request of Diamond Core Drill Manufacturers Association to replace the 1942 edition which, due to the war, was not put into effect, is being submitted to producers, distributors and users for acceptance. Revision, which presents the requirements of the 1932 edition in current commercial standards form, is available from National Bureau of Standards, U. S. Department of Commerce, Washington.

RAPID TRANSIT
(Before Steel)

PAINTED FOR [illegible] STEEL CORPORATION BY OLIVER MACPHERSON

YOU'D HAVE A HARD TIME GETTING ABOUT IN TOWN —WITHOUT STEEL

Without steel, you would still be riding in slow, horse-drawn omnibuses jolting over cobblestones. Or, you would poke along at five-miles-an-hour seated on hard benches in a wooden horsecar. You would stifle in summer and shiver in winter with only straw on the floor to keep your feet from freezing.

Today, all public transportation originates in steel. Buses, trolley cars and taxicabs; elevated, subway and suburban trains are made of steel—most versatile and available of all the metals.

Tomorrow, these facilities will be swifter, roomier, quieter, more comfortable—thanks to new, strong, tough steels, such as high-tensile Otiscoloy, perfected by Jones & Laughlin Steel Corporation. The greater strength of Otiscoloy makes possible the construction of lighter-weight vehicles that will carry more people, yet serve them better. With Otiscoloy, and other new steels developed by research, the transportation industry will be enabled still further to aid the growth of communities everywhere through improved rapid transit.

JONES & LAUGHLIN STEEL CORPORATION
PITTSBURGH

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CONTROLLED QUALITY STEELS

J&L STEEL

RAPID TRANSIT

Better service to take you places is the aim of all builders of new buses. More powerful, quieter engines, will mean faster schedules. New, all-steel buses will have increased and better insulation, more comfort and quiet; with air conditioning both summer and winter. Automatic drives will eliminate gear shift "jerks," give driver chance to concentrate on safe operation.

Everyone walked to work as late as 1827, unless he owned private conveyances, for there was no local public transportation in America. But in New York that year Abraham Brower's "Accommodation," a horse-drawn, omnibus seating 12, appeared on unpaved Broadway, fare 1 shilling.

First horsecars to be operated anywhere in world made their appearance in New York City in 1832, carried only 10 passengers.

"Riding on the grip" became possible for first time in 1873 when first cable car in the world made its run in San Francisco.

An electric car at a fair in Toronto in 1885 as an amusement stunt was the forerunner of today's extensive electric transportation system. James A. Gaboury who owned controlling interest in horsecar system at Montgomery, Ala., saw it and worked out a plan for electrifying his railway. Thus Montgomery became first city in world to have trolley car system.

Today's new streamlined trolleys are development of the Electric Railways Presidents' Conference Committee. Try-out car was completed in 1934. The new cars are now operating in 60 cities.

Trackless trolley line in Merrill, Wis., 1913, was first use of this system.

Elevated railways are as American as cable car. C. T. Harvey devised plan in 1867 for elevated road in N. Y. City. Cars were pulled by rope attached to stationary engine. Steam locomotives came next, then electrification.

Boston opened first subway in U.S. in 1897 (fifth in world). It handled more than 50 million passengers during first year.

N. Y. City all-steel subways cost nearly $1½ billions, haul 2½ billions of passengers a year, 6 millions a day, operate 12,411 trains daily at average speed of 17 mi. per hr., employ 35,000 people and you can ride 22½ miles in 78 minutes for 5 cents.

1st common-carrier motor bus in America was put in service in 1905 by Fifth Avenue Motor Coach Company in New York.

Bus and car builders use J&L Otiscoloy high-tensile steel to reduce deadweight and increase carrying capacity. For booklet write nearest J&L office listed at left or Publicity Manager, Jones & Laughlin Steel Corporation, Pittsburgh 30, Pa.

Engineering News *at a Glance*

WIRE DETECTIVE: Longitudinal fissures or cracks in fine tungsten wires are detected accurately by means of a test instrument, Walter E. Kingston, manager of the metallurgical laboratories, Sylvania Electric Products Inc., Bayside, N. Y., revealed recently. The instrument permits all tungsten wire for lamp and radio tube production to be subjected to a rigid physical test that discloses faults in crystal structure, the cause of premature failure of filaments used in fluorescent and incandescent lamps and electronic tubes.

TUBS FOR THE NATION: More than three quarters of all the tubs used on mechanical washing machines made in the United States are made by Mullins Mfg. Co. The large presses in its Salem, O., "tub room" turn out thousands of tubs every month. According to "Ceramic Forum," production at Mullins grew right along with the washing machine industry. Today, the company's customers include nine of the largest washing machine manufacturers in the country. Each has several models for which tubs of different sizes or shapes are required. Both round and square tubs are on the production schedule along with square dish washer tubs and smaller spinner tubs for dryers. By far, the most difficult tub to make is the square one. This requires an extra press operation and special dies so the metal does not buckle at the squared corners as the steel is drawn. This tub also is annealed to remove the strain from the steel.

STILL GOING STRONG: After passing out $147,081 in awards—ranging from $2,586.50 for an idea that helped speed production of equipment for atomic bomb manufacture to $2.50 for a suggestion that changed the design of solder ladles to avoid spilling hot metal, Westinghouse Electric Corp., Pittsburgh, finds its industrial suggestion system, born of wartime necessity, is maintaining sound health in the peacetime era. In the company's latest 12-month report, it was found an average of one out of every 13 workers participated during the period with a total of 28,055 suggestions. Of these, about 36 per cent were used.

ELIMINATES RUBBER BUMPS: New step toward making rubber technology a precise science is the development of a device that measures roughness of rubber reported by United States Rubber Co., New York. Called a rugosimeter, the instrument helps determine and eliminate causes of roughing and buckling when sheets of rubber are rolled out for use in products. It operates by measuring the resistance to passage of a stream of compressed air between the rubber surface being tested and a smooth plate resting upon it. If the rubber is rough, air passes through the "valleys" easily. Resistance to passage of air through these irregular channels is measured by comparison with the resistance offered by an adjustable needle valve.

WATER POWERED GRINDER: Water from a faucet provides all power necessary to operate a turbo grinder developed recently by Hudson Products Co., Detroit. The grinder can be set up ready to operate in 1 or 2 min. Its 3-in. diameter grinding wheel revs up from 3000 to 10,000 rpm, depending on the water pressure from the faucet. Turbo operating power unit is small enough to fit into the palm of the hand.

CARBON IN METAL POWDERS: Research is nearing completion on the production of steel powders with carbon content to meet buyers' specifications, it was learned in New York. According to Charles Hardy Inc., production methods were worked out for close control of combined carbon content, and microstudies show uniformity in carbon distribution. It was long recognized that new sintering techniques had to be evolved. These now are rapidly being brought to practical levels with the cooperation of Lithium Co. of Newark, N. J. Formal announcement of a full range of carbon steel powders probably may be made during the first quarter of this year.

PLASTIC RIVETS: Acrylic plastic, otherwise known as Plexiglas, is now being made in form of rivets strong enough to fasten light metals, rubber and other plastics, Douglas Aircraft Co. reports from Santa Monica, Calif. When used on fragile materials, the fasteners may be clinched without shock by simply heating and expanding the rivets with air pressure of a spring loaded mechanism. The process developed by the aircraft company produces both solid head and hollow shank rivets. Heat expansion method of insertion allows the shatter-resistant rivets to be used as blind fasteners where only one side of the assembly is accessible. According to the company, after forming a strong bond, exposed parts of the rivet may be turned into novel decorative effects by further heat application. If a fastener is defective, it may easily be withdrawn by heating the flattened end with a hot iron, reducing it to the original shank shape. For decorative effects, the rivets are being made in a variety of colors.

ICE-STORM RESEARCH: A specially equipped C-46 cargo plane is being used currently by the National Advisory Committee for Aeronautics to collect information on the structure of icing clouds, and the amount of heat that must be supplied to various parts of the craft to prevent ice formation. In gathering data to promote air safety, the Ames Laboratory of NACA, in cooperation with the Army Air Forces Weather Bureau and United Air Lines first locates the most severe icing storms in the country, then deliberately sends the plane through them. The C-46 is equipped with a special thermal ice-prevention system that harnesses waste heat of the engine exhaust gases to prevent ice from forming on wing and tail surfaces. Included in the equipment is an electrically-heated wing section mounted vertically on top of the fuselage. Windshields are electrically heated by a transparent conductive material, and propeller blades are fitted with electrically-heated shoes. One engine is equipped with a device that measures loss in propeller efficiency due to icing. Data on the size of water droplets in the icing cloud and amount of free water contained in a given volume of cloud are collected by other special instruments.

MIRROR FINISH: Mirror-bright finish is provided by a new copper plating process reported by MacDermid Inc., Waterbury, Conn. No wetting agent is used in the plating solution making only a cold water rinse necessary prior to bright nickel plating. Any type of copper anode may be used. The process may be carried out in a plain steel tank equipped with a heating coil.

NOTHING LIKE IT?: American industry has no stationary cutting machine comparable in flexibility, adaptability, design and ruggedness of construction with the large-size German machines, according to a report made by the Office of Technical Services, Washington. A so-called "portal machine" is said to take work on a carriage that runs on a 3.5-meter gage track. Only nine of these machines have been built thus far. These were used in profiling armor plate for tanks. Standard flame hardening machines, to be adapted to special user requirements, were marketed in Germany

ncipally by three firms, the report tes. Contrary to current American ctice, they furnished blowpipes, heads d regulating equipment, and acted in consulting capacity to assist the user modifying the machine to his purses. German under-water cutting uipment, for use beyond depths suite for an oxyacetylene blowpipe, is led with benzine fed under pressure nitrogen gas. Oxygen at about 200 psi pports the flame. Blowpipe is lit and usted on deck or shore, then passed wn to the diver who applies it to the el to be cut.

ADIES FOR MORE RESEARCH: conversion from wartime projects to ncetime activities at the Massachusetts titute of Technology, it is learned, indes reorganization of the spectroscopy oratory and extension of its facilities co-operative research and graduate truction. Thereafter, the laboratory to operate as an independent entity der the office of the Dean of Science. ring the war, the present laboratory s devoted almost entirely to work for Manhattan District. Specific research grams planned under the new setup in the fields of wavelength and insity measurements, ultraviolet, visible d infra-red absorption spectrophototry and the Raman and Zeeman efts.

AINTAINS CONTINUITY: A new ial cable that maintains continuity of vice in heavily wooded areas, and minates cost of constant tree trimming o be shown by American Steel & Wire . at the Electrical Engineering Exposin in New York. It consists of a strong el messenger cable plus three heavily ulated copper conductors finished with Amerprene conducting rubber cover t is as tough as tire-tread rubber.

LEVISION FOR INDUSTRY: Folving its first successful use, television expected to be a valuable aid in conting dangerous research experiments m a distance, and in the observation dangerous processes of all types inding radioactive substance in atomic wer plants. This was disclosed by rnsworth Television & Radio Corp. rt Wayne, Ind., and Diamond Power ecialty Corp., Detroit, which collaboed in developing the industrial unit. practical operation the past 9 months Consolidated Edison's Hell Gate power nt in New York, the first industrial stallation is being used successfully to ow the water level in a boiler. A oto-electric camera focused on the ter-level gage continuously transmits e picture—a distance greater than an erage city block and obstructed by eight floors and a building wall—to the associated control panel where the image is reproduced on a screen. Technicians state the development is ideal for use in observing conditions in steel furnaces, in oil wells, condition of pipelines, pressure pumps etc. Complete installation includes four units—camera with deflection unit, two small power units and the viewer. Except for the camera pickup tube, all electronic tubes are standard and easily available. Actually fewer tubes than a good radio set are used in the installation.

UNBLINKING EYE: An eye that never closes is used by Bell Telephone Laboratories to guard the amplification in long-distance circuits. It consists of a speck of metallic oxide imbedded in a glass bead hardly larger than a pinhead and mounted in a vacuum. When the Thermistor, as the eye is called, is heated its resistance to electric current changes rapidly. Connected in the output of repeater amplifiers, it heats up as power increases, cools as power decreases. This change in temperature alters the resistance, in turn, the amplification, thus maintaining power level. Made by Western Electric Co., the device detects temperature changes of one-millionth of a degree. During the war, Bell scientists produced a Thermistor that could "see" the warmth of a man's body a quarter of a mile away.

ADDED SAFETY FOR PLANES: First plane to use extensive explosion-proof electrical equipment is Republic's "Rainbow," huge 400 mph, 46-passenger transport now being built for American and Pan-American Airlines. According to General Electric Co., Schenectady, N. Y., explosion-proof motors and controls are being used in the nacelle of the craft. The motors were specially designed at no increase in weight and size, and control equipment at only a slight increase. Equipment supplied by G-E includes automatic temperature control systems for control of cowl flaps, oil-cooler doors, intercooler doors and wing-flap systems. The wing-flap control system provides remote positioning of the flaps from the cockpit with automatic air-speed limits to prevent overstressing flap structure. Powered by four 3500-hp Pratt & Whitney Wasp-Major engines, the plane will operate at altitudes up to 40,000 ft. Its estimated range is in excess of 4000 miles.

NO WAR WEAPON: Information from this guided research missile, developed by National Advisory Committee for Aeronautics, Washington, is transmitted to the ground by telemetering equipment located within the rocket as it "shoots" along at speeds of about 600 mph. Many instruments carried by the Tiamat, as the 14-ft, 600-lb missile is called, provide scientists with a record of such basic information as speed, control movements, degrees and speed of roll, and data on its vertical and lateral acceleration. Both radar and optical equipment is used to track movements of the missile during its flight. View here shows the successfully flown aviation "guinea pig" shortly after it was launched at Langley Memorial Laboratory. It leaves launcher by power of a rocket booster assembly mounted on the missile's tail. This produces 7200 lb of thrust for 3½ sec—sufficient to get the missile up to flying speed. On exhaustion of the booster, entire assembly drops away in flight and an internal rocket engine that develops 200-lb of thrust continuously for 45 sec, continues the flight

Materials Handling Expo

(*Continued from Page 93*)

and Charles M. Parker, secretary, committee on manufacturing problems, American Iron and Steel Institute, led a panel discussion on "Iron-Steel, from Bulk Ore and Coal to Finished Steel."

Last week's exposition, attended by industrial representatives from all sections of the country was sponsored by American Warehousemen's Association, Association of Lift Trucks and Portable Elevators, Caster and Floor Truck Manufacturers Association, Electric Industrial Truck Association, and Materials Handling Institute.

Among the exhibitors were the following listed here with equipment shown and persons in attendance:

Aerol Co., Los Angeles: Industrial trucks, wheels and casters. Representatives—W. R. Murdock, C. R. Irwin, W. R. Law, J. H. Loebs, George Knafler.

Aeroquip Corp., Jackson, Mich.: Two display panels, hydraulic unit, hydrauliscope. Representatives—Clarke Field, E. J. Hurley.

American Engineering Co., Philadelphia: Operating monorail hoist, car puller. Representatives—J. C. Mevins, C. A. Boecker, W. F. Digby, D. W. Herbert, J. L. Taylor.

Anthony Co., Streator, Ill.: Photograph panel, special electrically-operated Lift-Gate equipment (hydraulic elevative truck body tailgate). Representatives—Mark Anthony, Frank Novotney, John G. Reinhard.

Arkansas Pallet Corp., Little Rock, Ark.: Pallets. Representatives—W. R. Jordan, George D. Kelley.

Automatic Transportation Co. division, Yale & Towne Mfg. Co., Chicago: Skylift, fork truck, Transtacker, Transporter, Transtractor; Representatives — E. F. Twyman, general manager; Roy L. Wolter, general sales manager; J. A. Baldinger, and J. M. Johnson, assistant sales managers; Fenton Hall, export representative; C. H. Greener, general service manager; H. J. Framhein, chief engineer, Transporter Div.; R. M. Whitney, assistant advertising manager; C. P. Whiteley, materials handling engineer; J. L. Van Cara and Paul Scribner, service engineers.

Baker Raulang Co., Cleveland: Center control and articulated fork trucks. Representatives—D. L. Darnell, vice president in charge of sales; G. B. Davis, assistant sales manager; M. W. McMillan, advertising and export manager; H. B. Grieg, field engineer; E. E. McVeigh, field engineer; H. C. Seeley, manager, service dept.; Walter Schoch, assistant manager, service department.

Barrett-Cravens Co., Chicago: Power Ox, Pallet Ox, hand pallet trucks, hand lift-trucks, lift-truck skids, pallets, die tables, portable elevator; Representative —F. H. Heimer, President.

Bassick Co., Bridgeport, Conn.: Industrial truck casters and wheels, miniature model track installation; Representatives —Sanford Evans, engineering and development dept.; George Biggs, sales engineer; A. J. Israel, special sales representative; George L. Meyer, Jr., president; W. F. Herold, executive vice president; W. G. Reycroft, vice president and general sales manager; W. K. Meyers, manager Chicago office; C. B. Ford, Dayton, O.; E. H. Leiphart, G. Kohlmaier, Detroit; F. O. Johnson, Jamestown, N. Y.; R. D. Mount, advertising manager.

Bearing & Transmission Co., Ohio Conveyor Div., Findlay, O.: Power conveyors, gravity roller conveyor, hand truck. Representatives—R. W. Lashells, T. B. Lashells, R. A. Snyder, Burton Zook, W. F. O'Neall, W. B. Stowell.

Bosworth Engineering Co., Lakewood, O.: Aluminum portable industrial belt type conveyors: Representatives—S. B. McNutt, J. C. Moser, W. G. Bosworth, J. H. Kirkendall, J. G. Tullis, J. T. McNutt.

Brainard Steel Div., Sharon Steel Corp., Warren, O.: Steel strapping, strap and band tools, accessories. Representatives—L. J. Lyons, A. E. Adamson, F. E. Houck, J. D. Boyer, B. E. Baker.

E. W. Buschman Co. Inc., Cincinnati, O.: Roller-wheel overhead trolley and belt conveyor. Representatives—O. T. Carter, E. W. Buschman, W. E. Todd.

Clark Tructractor, division, Clark Equipment Co., Battle Creek, Mich.: Electric Stalwart, Clarkat "C", battery-powered electric carloader, gas-powered fork truck, truckloader, expendable and permanent type pallets, Pul-Pac; Representatives—Ezra W. Clark, James H. W. Conklin, sales manager; Russell F. Oakes, director advertising and public relations; Lawrence A. Wilson; George L. Turner; C. D. Stanley; Martin E. Graham; Robert H. Helm; Madison L. Crawford; Everett M. Sharp; Donald R. Laird; Maxwell A. Goodwin; William S. Polk; Kenneth P. Burgoyne; Glen R. Case; C. E. Staninger; Philip E. Campbell; Don S. Ferguson; F. J. Vandemark; Harry E. Manley; W. A. Oakley; James Tinlin; Harry B. Clapp; Robert H. Griffin; Charles W. Meldram; C. I. Ucker; Preston Faller; Hugo Fehlenberg; J. H. Ryder; G. Darling; J. A. Newson.

Conco Engineering Works, division D. Conkey & Co., Mendota, Ill.: Torped electric hoist, Hyatt roller bearing trolle differential hand chain hoist, pictu display of Conco overhead electric trave ing cranes; Representatives — G. Smith, R. W. Conkey, W. G. Van Ette vice presidents; B. L. Hulse, chief eng neer Crane and Hoist Div.; C. R. Sabi L. E. Ritzman, Cleveland.

Conveyor Repair Service Inc., Clev land: Portable conveyors. Represent tives—Earl Ensinger, Lee Ensinger, Ke neth Shaffer, Iona Ensinger.

Crescent Truck Co., Lebanon, P Various models of electric Palletier lif Representatives—John Hunsicker, cha man of the board; C. D. Eiler, presider R. E. Clark, vice pres.-sales; J. Krause, secretary-chief engr.; H. D. Ke fer, factory service manager; T. H. Klie engineering dept.; James Ehrhorn, fa tory sales; H. D. Little, engineering de

Divine Bros. Co., Utica 1, N. Y.: dustrial truck wheels, Formica, can cushion, rubber, and composition, ind trial truck casters, wheel and caster te ing machine; Representatives — C. Mead, vice president; J. D. Blair, ch engineer.

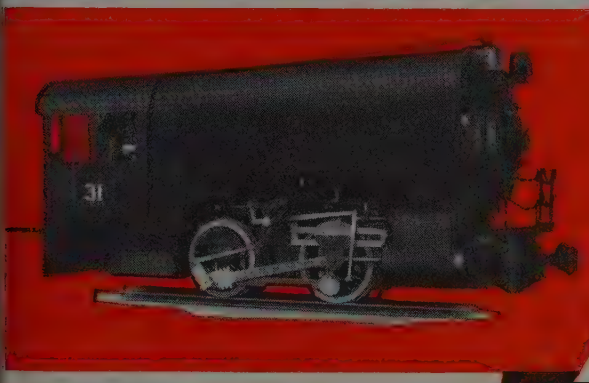
Durant Mfg. Co., Milwaukee: Ind trial counting machines including w and lineal measuring machines; bot can, case, stroke, conveyor and elect counters, etc.; Representatives—Rob B. Winkler, secretary and sales manag T. M. Black, James D. Black, P. Wagner, and W. R. McDonald, Clevela sales office.

Electric Products Co., Cleveland: B tery charging and control equipme Representatives — Gordon J. Berry, v president; F. K. Rouge, vice presid G. J. Doss, R. H. Ehret, R. R. Kova sales dept.; Robert G. Redhead, adver ing manager.

Elwell-Parker Electric Co., Clevela Telescoping high-lift platform tr telescoping fork-type truck; Represe tatives—W. A. Meddick; C. B. Cook; H. Gill; S. R. Brookshire; O. R. Heic rich; George Verner; F. H. Haldy; T Wyman; P. B. Ruppe; R. F. Crawf F. J. Avery; George C. Asplin; J. Colton; G. H. Brown; W. D. Par Frank Blotch; C. J. Burgy; G. E. K R. F. Skarnes; F. E. Price; Zar Rea Earl Wood; E. C. Holden.

Executone Inc., New York: Interc munication and paging system. Re sentatives, J. A. Richards, sales pro tion manager; H. D. Hughes, Clevel district; Harold Boudreau, Detroit trict; Henry Pearson, Pittsburgh dist

PORTER Steam Locomotives



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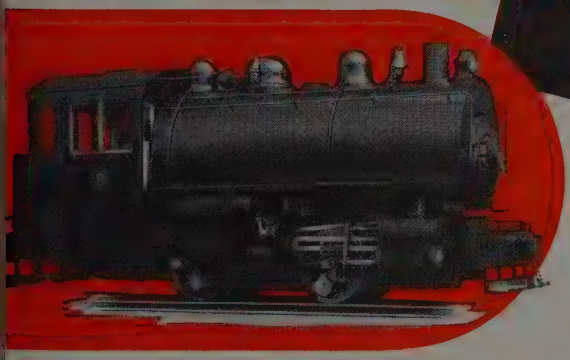
Greater Availability



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District Offices in Principal Cities

Fab-Weld Corp., Philadelphia: Steel skids, drop bottom hoppers. Representatives—Frank W. Bruckerl, George J. Hanhauser.

Fairbanks Co., New York: Steel frame, two-wheel hand trucks and steel frame platform trucks, bronze and iron body valves; Representatives—C. L. Haslup, sales manager; A. T. Wendler, manager, Pittsburgh branch; C. E. Thyng, manager, Boston branch; L. S. Craig, Pittsburgh branch; W. H. Peate, Cleveland sales representative; Charles G. Long, Michigan sales representative; W. O. Swinford, Rome, Ga. plant; R. G. Macbeth, sales promotion manager.

General Box Co., Chicago: Sample boxes and pallets. Representatives—George T. Walne, sales promotion manager; Charles C. Bush, Alan Irwin, Wallace Vance, Marvin Watkins.

A. J. Gerrard & Co., Chicago: Steelbinder and bulkbinder machines, complete strapping unit, Colorband identification strapping, accessories and supplies; Representatives—Henry Wenk, vice president; C. M. McCarter, branch manager, Cleveland; H. C. Deifenderfer, branch manager, Pittsburgh; D. F. Downing, vice president.

W. F. Hebard & Co., Chicago: Shop Mule tractors. Representatives—W. F. Hebard, R. M. Dickenson, J. W. Dickenson Jr., J. R. Blake Jr., J. Mlynski, J. W. Cannon, E. L. Virden Jr., W. A. Hensel, R. Johnson.

Hertner Electric Co., Cleveland: Four motor generator, battery chargers—one with panels removed to show unit interior, one motor generator unit. Representatives — Robert Neiswander, Frank Young, Roy Rummel, Frank McCann, C. C. Dash, Wm. Smart, Jack Ewing, H. P. Scherer.

The Hill Acme Co., Canton div., Cleveland: Canton portable floor crane; Representatives—J. L. Suloff, sales manager; K. B. Sadler, sales engineer.

J. R. Hooper Co., Brookfield, Ill.: Stainless steel worktable belt conveyor, live roll chain driven conveyor, transfer unit, portable belt, wheel and gravity roll and flat top chain conveyors. Representatives—George E. Peterson, Everett V. Thomson, A. J. Pohlman, Fred Bils.

Hyster Co., Portland, Oregon: Model MH straddle truck, lift trucks, Karry Krane; Representatives—Philip S. Hill, general sales manager; R. M. Ronald, Western Div. sales manager, Clarence H. Collier, Jr., Eastern Div. sales manager; Dar Johnson, manager, sales promotion; Hal White Jr., sales promotion department; Milton H. Smith, supervising engineer, Industrial Truck division.

Joyce Cridland Co., Dayton, O.: Hydraulic Materialift, industrial, mechanical and hydraulic jacks. Representatives—Huston Brown, president; Kent Holt, vice president and secretary; Warren Webster, vice president and treasurer; Merle P. Smith, general manager; Don W. Switzer, manager Materialift Div.; J. P. Gentry, Western Div. manager; H. W. Landis, Eastern Div. manager.

Lawrence Pallet Exchange, Division of Lawrence Universal Pallet Corp., San Francisco: Universal pallets, model box cars, demonstration of loading box cars with palletized materials. Representatives—C. E. Baker, A. T. Bear, D. I. Pursley.

C. B. Lewis Co., Watertown, Wis.: Stacking boxes, stacking skid boxes, box trucks and shipping boxes. Representatives — H. Riedemann, sales manager; Lewis Schuman, Cleveland representative.

Lewis-Shepard Products Inc., Watertown, Mass.: Electric and gas power fork trucks, power jack lift truck, hydraulic and mechanical lift trucks, electric stacker, handy hoister, floor trucks, skid platforms. Representatives—A. L. Lewis, president; F. J. Shepard, treasurer; L. E. Nivling, sales manager; H. M. Palmer, F. A. Gray, W. Dawes, L. B. Barnard, P. S. Ward, W. H. Jaynes, S. W. Ristow, W. K. McMeekin, F. H. Trethewey, G. H. Dettling, C. H. Huntoon, M. G. Jogeese, D. A. Salentine, F. H. Thompson, J. A. Miller, E. E. Wallace.

Lois Metal Products Corp., Brooklyn: Dolleys, hand trucks, Hang-a-File, cabinets. Representatives—Leo Stern, president; Max Himelson, treasurer; Rudy Himelson, supervisor; Mike Suskin, sales manager, Wm. H. Lake, Cleveland salesman.

Lyon-Raymond Corp., Greene, N. Y.: Lightweight pallet lift truck, telescopic model hydraulic elevating table, hydraulic high lift truck; Representatives—George G. Raymond, president and general manager; George G. Raymond, Jr., secretary and assistant treasurer; Stanley R. Bryant, sales manager.

Material Movement Industries, Chicago: Portable power conveyors; Representative — Horton Conrad, managing partner.

Mansaver Industries Inc., New Haven, Conn.: Scale models of grabs; Representative—J. Breslav, president.

Marsh Stencil Machine Co., Belleville, Ill.: Stencil cutting machines and marking supplies, attachment for cutting circular stencils. Representatives — Wa Marsh, president; E. J. Marsh, secretar A. S. Moyer, Cleveland office.

Meese Inc., Madison, Ind.: Canv baskets and trucks; Representatives— B. Stoltz; W. G. Harris; E. W. Mees E. A. Abramson; A. P. Carstensen Ohio Equipment Co.

Melooz Mfg. Co., Los Angeles: Tw wheel hand trucks and attachments. Re resentatives — Ben Hooz, Julius Free man, Joseph Hooz.

Mercury Mfg. Co., Chicago: Skeleto ized stand-up center control fork truc "Tug" electric tractor, low-lift elevatin platform truck, tilting telescopic sitdow center control fork truck, "Banty" gas line truck, etc. Representatives—O. Henkle Jr., Norman Severson, L. Kline, H. E. Mily, T. W. Barnes, L. Meissner Jr., Stuart Morley, A. W. Le M. T. Murray, John R. Henkle, Newa Bryson, John Best, Charles Wiertz.

Morrison Co., Cleveland: H B Cho Boy tilt tray truck scaffold: Represent tives—Harry Morrison, Jim Morriso Bill Kelley, Bill Curran, Al Untch, Bi Welch, Eleanor Mellinger.

The Moto-Truc Co., Cleveland: Mod TEL telescopic high lift stacker, mod PAL V-12 low lift pallet truck; Re resentatives—I. F. Schreck, president; L. Beisel, vice president in charge sales; P. F. Schreck, factory superinte dent; J. W. Montigney, Jr., assistant the sales manager; S. W. Williams, pu chasing agent.

National Metal Edge Box Co., Phil delphia: Improved metal edge method material handling inventory control; Re resentatives—Ralph A. Branca; M. Junkin; S. George Karr; William Muhleisen; Charles Paist.

National Metal Edge Box Co., Phil delphia, Metal edge method of mat rials handling and inventory contr Representatives—L. E. Berry, R. Branca, M. P. Junkin, S. G. Karr, W. Muhleisen, C. Paist.

National Pallet Corp., Pittsburg Wooden pallets. Representatives—Har Miller, Lee Miller, Marian Bazerma Robert N. Lando.

National Wooden Box Associatio Washington: Wooden boxes, pallet crates. Representatives—Wm. H. Sard Jr., Frank H. Kimball, T. C. Post, Cha E. Felt, C. Carlberg Jr.

Nutting Truck & Caster Co. Inc., Fa bault, Minn.: Floortrucks, dollies, caste and wheels. Representatives—A. Morris, K. F. Heath, M. A. Larson, H. Morrison, J. H. Morrison, W. M. Kelle

W. E. Curran, A. M. Untch, S. Wrabel, W. A. Welch.

Ohio Equipment Co. Inc., Cleveland: Exhibit included Thomas Truck and Caster, and Yale & Towne equipment. Representatives—E. M. Abramson, A. P. Carstensen, Sam Zipp, E. J. Werner, Clarence Weidner, C. Baden, A. Burgess.

Orangeville Manufacturing Co., Orangeville, Pa.: Floor trucks. Representatives—L. C. Connor, J. C. Connor.

The Powell Pressed Steel Co., Hubbard, O.: Steel skids, pallets, skid boxes and similar types of equipment; Representatives—H. S. Wylde, vice president, H. L. Powell, assistant vice president, and A. G. Knowles, manager of sales.

Rapids-Standard Co. Inc., Grand Rapids, Mich.: Rapid power booster, Stevedore, Jr., Press-Veyor, Rapid-wheel gravity conveyor, spur curve, merry-go-round installation assembly of Rapids-Standard gravity conveyor, etc.; Representatives — Warren Hensel; Henry Herrman; John Kleimeyer; Tom Lloyd; C. H. Ellis; R. R. Scott; George R. Brockway; James MacDuffee; Nick M. Quint; Jim Fuller; Edwin W. Siefert.

Ready Power Co., Detroit: Power units. Representatives—George W. Frampton, Al Huneck, Lew Tanney, R. W. Pelto, Arch R. Smith.

Revolvator Co., North Bergen, N. J.: Electric portable revolvator and manually operated lift trucks. Representatives—R. D. Fisher, M. F. Hoff, H. G. Taylor, A. C. Wigren, G. P. Crissman, Carl Somers, H. S. Germond III, A. P. Guillard, P. D. Germond.

Ross Carrier Co., Benton Harbor, Mich.: Fork lift trucks, straddle carriers. Representatives—A. P. Ross, D. H. Ross, L. A. DePolis, C. G. Kennedy, A. L. Bliven, James Merritt, Robert Elwell, Marvin Dickey, Robert Carroll, Roger Spencer, Edward Repke.

Sabin Machine Co., Cleveland: "One-man" barrel and drum handling trucks; Representatives—O. C. Sabin, executive manager; J. C. Petzinger, engineer; O. J. Gartner, sales engineer.

Salsbury Motors, Inc., Pomona, Calif.: Turretug, Turreteer, Power Package; Representatives—C. Plin Mears, sales manager, Turret Truck Div.; Harry C. Howard, advertising and sales promotion manager.

Service Caster & Truck Corp., Albion, Mich.: Industrial casters, floor trucks, dollies, hydraulic lift trucks, single stroke lift trucks, portable elevators, gasoline powered folk lift trucks and levelers. Representatives — Edward C. Hamm, president; A. Graham Reid, vice president; E. C. Goodall, sales manager; W. H. Haefele, sales manager of the Mo-Tow-Lift Dept.; William Race, assistant sales manager; Garrett Gething, advertising manager.

Silent Hoist & Crane Co. Inc., Brooklyn, N. Y.: Bantam Krane Kar, Lift-O-Krane, electric capstan car puller, double gypsy winch, single drum winch; Representatives—Joseph W. Wunsch, president; Murray Feit, sales engineer; J. Ralph Lewis, Cleveland.

The Sisalkraft Co., Chicago: Fibreen paper packaging applications.

Skarnes Engineering & Supply Co., Minneapolis: Montour Rol-A-Lift for moving large boxes. Representatives—R. F. Skarnes, W. G. Burry.

Speedways Conveyors Inc., Buffalo: Gravity wheel and Speedways conveyors, portable power lifts, new Speedlift Jr. Representatives—O'Roland Read, Vernon H. Maurer.

Stanley Works, Steel Strapping Div., New Britain, Conn.: Nailless strapping and carlanding systems for reinforced corrugated containers, wood boxes, bundles, etc. Representatives—F. E. Koerner, R. D. Thomas, R. W. Scoville, R. D. Johnston.

Steel-Parts Manufacturing Co., division, Blackstone Mfg. Co. Inc., Chicago: Level, horizontal type, and adjustable and elevating type conveyors; Representatives—L. H. Klauer, director of sales; Robert June, S. J. Herring, Frank Delano, representatives.

Thermoid Co., Trenton, N. J.: Solid rubber-tired aluminum industrial wheels, industrial hand truck; Representatives—H. W. Overman, manager, Industrial Wheels Div.; E. J. Dunlap, sales promotion manager; J. R. Lambert, district manager.

Thomas Truck & Caster Co., Keokuk, Iowa: Cast, pressed, and semisteel casters with metal, molded-on rubber, cushion rubber, and pneumatic tired wheels; industrial trailer, safety wagon truck, etc.; Representatives—J. F. Thomas, president and general manager; L. B. Miller, secretary-treasurer; R. P. Moore, sales manager; E. D. Biddle, advertising manager; Wm. F. Wulf, plant supt.; Wm. L. Guild, product engineer; M. G. Long, engineer; C. P. Anderson; F. J. Simpson; J. Henderson; J. W. Hutchison, sales department.

Towmotor Corp., Cleveland: Unloader, telescope lift trucks. Representatives—C. E. Smith, vice president; A. H. Roth, advertising and sales promotion manager, Ray Scott, Dave Cissna, Gordon Winters.

Transi-Tier Truck Co., Portland, Oreg.: Industrial lift truck, fork truck, power package consisting of engine, transmission, hydraulic lift, propelling parts, front wheels and drive axle. Representatives—Glen M. Ede, sales manager; Verne Johnson, George Butler, R. C. Chambers.

Truck-Man Inc., Jackson, Mich.: Truck-Man model D, utility platform truck; Representatives — T. B. Funk, president; R. L. Dunlap, vice president; W. S. Butterfield, secretary and treasurer; Walter Mayer, general manager; R. O. Hoyt, chief engineer; B. D. Phillips, factory representative.

Truscon Steel Co., Youngstown: Metal boxes, skids and pallets; Representatives — W. M. Whalen, general sales manager; J. H. Ayre; L. S. Todd; T. G. Watkins; A. J. Farrar.

Union Metal Manufacturing Co., Canton, Ohio: Steel skids, boxes and pallets, fork roll-over box, box truck, skid box, skid with detachable box, open-side pallet rack (tiered), knock-down pallet box; Representatives—E. V. Bailey, L. West Shea, L. E. Collins, K. C. Dorland, Eric Brady, A. S. Fromm.

Unit Crane & Shovel Corp., Milwaukee: Working model of one-piece gear case; scale model of unit 357 self-propelled Mobile Crane; Representatives—Jack Lumley, sales dept.; George W. Mace, advertising manager.

West Bend Equipment Corp., West Bend, Wis.: Portable elevators and stackers, hydraulic lift trucks, skid platforms and nesting boxes, hydraulic pallet type lift truck; Representatives—Clifford J. Marks, production manager; Philip A. Kessler, assistant chief engineer; Vernon Maurer, district sales engineer, Cleveland; G. W. Ball, sales manager.

Yale & Towne Manufacturing Co., Philadelphia: Cable king electric wire rope hoist, light duty electric midget king hoist, hand chain hoists including pul-lift, high lift tiering fork truck, work-saver electric trucks, Kron counting scale and crane scale; Representatives—Wm. K. McGreevy; R. J. Arehart; E. M. Abramson; F. X. Vogel; M. G. Peck; J. D. Young; Wm. A. Hale; A. P. Carstensen; S. W. Bibb; W. Glen Tipton; C. O. Hedner.

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Controlling Quality
AT THE MACHINE

. . . . minimizes axle rejects

TRUCK axles often encounter severe service—the very nature of their use makes that inevitable. Sometimes, even slight differences between actual and specified fits may cause a great deal of trouble. It is highly important, therefore, to know just what the dimensions of critical elements actually are before they are assembled.

In this work, Timken Detroit Axle Co., formerly inspected axle components before assembly by using common hand gages. With all due respect to conscientious inspectors, there was no way of getting around the human element. Determined to cut out all chance of errors, the company instituted a program using gages and instruments to control quality at the machine.

Foundation of quality control is the indicating type of gage that tells how much the dimension is within or outside of control limits. At Timken, a battery of Precisionaires, supplied by Sheffield Corp. of Dayton, O., is used in the front axle department, one at each broaching machine, to check the knuckle pin hole. The broaching operator knows all the characteristics of the hole—the instrument shows what they are. It reveals any tendency for the hole to go out of tolerance—and the operator makes necessary adjustments while parts are still within control limits, and before faulty parts are produced.

Complaints are now practically nonexistent, either as to the assembly of the knuckle pin in the hole, or about the performance of the axle in service on a truck. Another battery of gages, using both air spindles and Airsnaps and a Multichek for inspecting seven points simultaneously, stand guard over the several critical dimensions of drive gear, the pinion and the pinion keyway.

According to Timken, use of indicating gages at the machine gives the operator a feeling of self confidence and pride in his work that prompts him to try to hit the middle of the tolerance limits. Use of indicating gages and instruments to control the machining processes also reduces rejects to a minimum and eliminates troublesome borderline parts. In addition, material is saved, machine running time is reduced and less operator time is required per job. No time is lost in assembly as all parts mate as they should.

Fig. 1 (left)—Operator is checking knuckle pin hole with an air-flow gage, and can make necessary adjustments while parts are within control limits

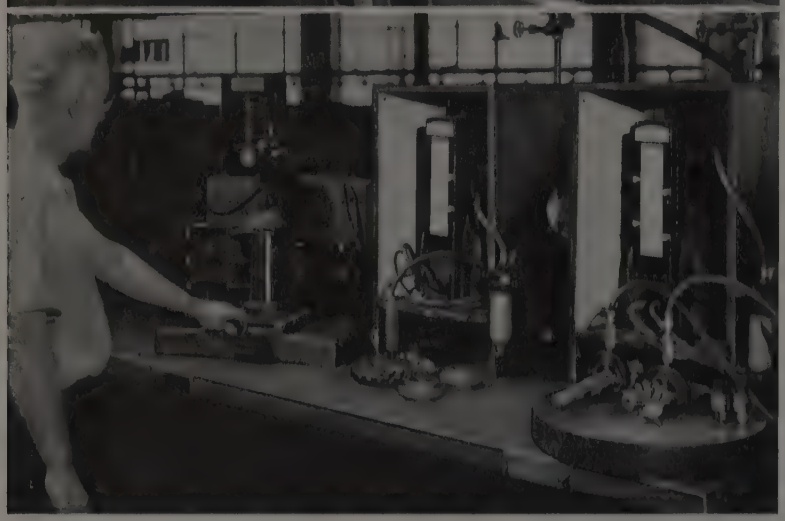

Fig. 2 (bottom)—Battery of air-flow type gages and a multiple electric gage provide quality control for several critical dimensions of pinion, pinion keyway and drive gear

Aluminum Alloy Selector

Technical information concerning 18 widely used aluminum alloys is presented on a slide-rule type aluminum alloy selector chart available from Reynolds Metals Co., Louisville.

One side of chart shows chemical composition, physical constants including specific gravity, density and specific heat, and data on maximum forging temperature, recommended cycles for solution heat treatment as well as precipitation heat treatment and annealing. Other side includes tempers available for each of seven product forms, ranges of tensile strength, yield strength and various specifications. Properties of each of the 18 alloys are also given.

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South Bend Precision Lathes offer special advantages to production shops, laboratories, and toolrooms that handle diversified work requiring a wide variety of exacting operations. They simplify change-over from one operation to another; help get new jobs into production quickly and economically. With their wide range of spindle speeds, they machine light metals, plastics, and steel with equal ease. A complete line of attachments and accessories enables South Bend Lathes to handle many operations which otherwise might require special fixtures or machinery. Take advantage of this versatility, coupled with South Bend precision, speed, ease of operation, and dependability, to increase the capacity and efficiency of your shop. South Bend Precision Lathes are made with 9", 10", 13", 14½", and 16" swings, collet capacities to 1", and bed lengths to 12'. Write for complete catalog.

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Industrial Equipment

Mobile Hoist

A mobile hoist of 1 ton capacity which can be used for lifting and transporting heavy chucks, dies, machine parts and unloading and loading of trucks, is announced by Almco Inc., Albert Lea, Minn. Requiring only one man for both lifting and transporting, the hoist, immediate right, is of welded tubular steel construction and rolls on four ball bearing casters. It can be furnished with hand-operated worm-drive winch, or with electric or chain hoist. Hoist is offered in 7 and 9 ft over-all heights, with greater heights available. The 9 ft model permits a total lift of 8 ft 5 in. with the winch. Base is 6 ft long, 46 in. wide, and clearance between legs is 40 in.

Steel 1/20/47; *Item No.* 9109

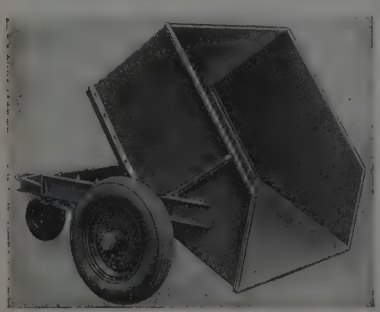
Pneumatic Screw Driver

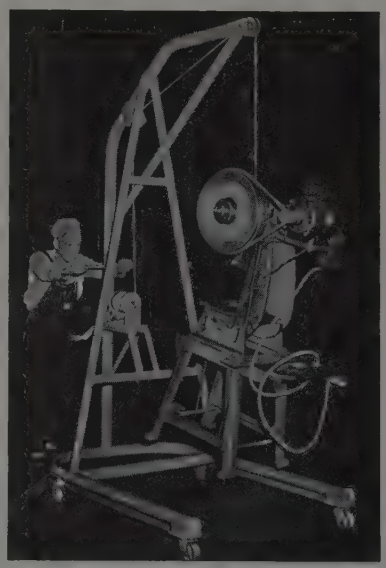
Keller Tool Co., Grand Haven, Mich., is producing pneumatic screw drivers for driving small screws on a production basis. Size 12A-1, model 1671, has a free speed of 2500 rpm and is designed for delicate operations using machine screws up to size No. 3 and very small self-tapping and wood screws. Size 12A-1C, model 1672, has a free speed of 10,000 rpm and accommodates screws in the No. 3 to 6 range. Impacting force of the built-in clutch gives this model added drive. Pneumatic pick-up enables operator to pick up screws with air suction finder. Bits and finders to fit screws from No. 0 through 6 are available, all interchangeable.

Steel 1/20/47; *Item No.* 9114

Dump Trailer Truck

Phillips Mine & Mill Supply Co., 2227 Jane street, Pittsburgh, announces a Phil-Dump trailer truck, directly below, that speeds up hauling and dumping in industrial plants. It is equipped with pneumatic tires and an optional center caster for maneuverability and ease in handling. Units construction includes the roll-over



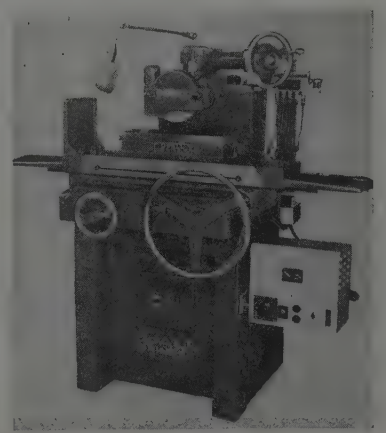


type body, chain release and quick return to normal position. Of welded steel construction throughout, the trailer is of 1 cu yd capacity.

Steel 1/20/47; *Item No.* 9112

Hand-Operated Grinder

Hardened gears running in needle bearings and driven by a 16 in. hand wheel make for smooth, easy table action in the hand-operated grinder announced by DoAll Co., Des Plaines, Ill. Designated model GH, grinder, shown below, has a 1 in. cross feed screw, located in the center of the saddle. Heavy, deep V ways are located between saddle and base and one flat way is between table and saddle. Cartridge type direct-drive spindle has ball bearings throughout with automatic takeup for wear. The 1-hp motor is direct coupled, and completely enclosed.



Hand wheel for spindle elevating screw is graduated in half thousandths with vernier adjustment to 0.0001-in. Working area of table is 6½ x 19¾-in. with a maximum work height of 12 in. Grinder accommodates a 7 in. wheel.

Steel 1/20/47; *Item No.* 9113

Floor Cleaner, Polisher

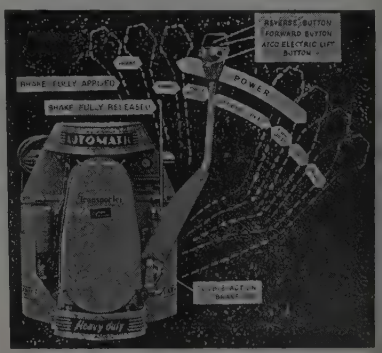
An extra-low disk-type floor machine of new design, for polishing, scrubbing, steel wooling and other maintenance, is being introduced by the G. H. Tennant Co., Minneapolis 11. Feature of machine is a side-polishing brush that cleans and polishes flush with the walls. Overall height of machine is less then 12 in. through use of a "pancake-shaped" motor centrally mounted over cleaning disk.

Machine has a wheel adjustment which allows it to operate in divided weight position with 50 per cent of weight on the wheels, or with the full pressure on the brush. Machine accommodates 15-in. accessories for dry cleaning and burnishing with steel wool, for polishing and scrubbing, and for rug cleaning.

Steel 1/20/47; *Item No.* 9895

Electric Lift Truck

Featuring alternate types of lift—electric and foot—the Transporter motorized hand truck, manufactured by Automatic Transportation Co., 149 West 87th street, Chicago 20, is built in 4000 and 6000-lb load capacity platform models and a 4000 lb capacity pallet model. Electric lift model, illustrated below, has all controls—forward and reverse, speed, lift, steering and brake—arranged so that they may be regulated by one hand and operated virtually simultaneously. The new electric lift pump and motor use less current than the reserve left in the foot-lift Transporters' standard 11-plate battery at the



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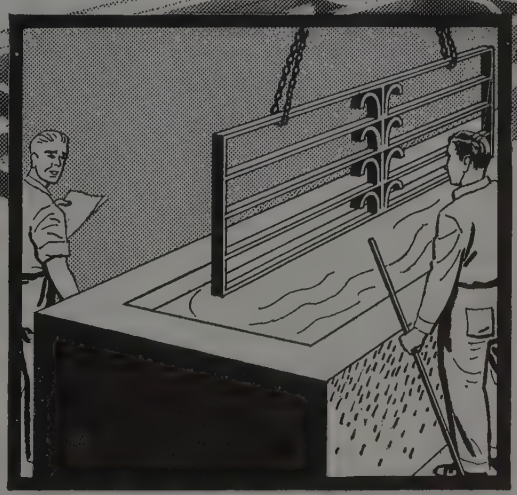
Hot-Dip Galvanized Bridge Railing *Lasts Longest*



YEARS and YEARS of service are added to the life of bridge railings and other exposed installations that are Hot-Dip Galvanized by the Hanlon-Gregory process. This method of fusing base metal with molten zinc is your solution to expensive maintenance problems.

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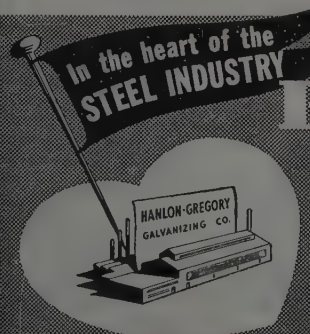


HANLON-GREGORY
GALVANIZING COMPANY

Pittsburgh, Pennsylvania

end of a full working day. Another feature is a double-position brake which is applied either by raising or lowering the guide handle. Guards are designed to protect lift components from damage during operation, yet leave them accessible for maintenance.

Steel 1/20/47; *Item No.* 9110

Take-Up Wire Reel

Appleton Electric Co., 1701-59 Wellington avenue, Chicago 13, announces a new type YS Reelite designed especially for use with traveling hoists. In operation, it automatically takes up and pays out conductor cable, having no exposed current collectors, trolleys or wires.

The reel serves any stretch of track—straight, or with one or more bends—up to double its cable length. For curved track it is furnished with swivel base, permitting rotation up to 335 degrees. Conductor cord is kept gently taut at all times. Safety grounding through an extra conductor prevents electrical mishaps.

Steel 1/20/47; *Item No.* 9885

Dust Collector

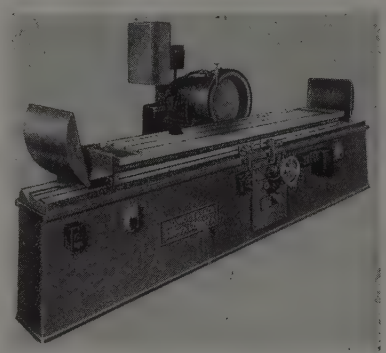
Large volumes of collected dust are removed with model 11w50 Dustkop recently announced by Aget-Detroit Co., Ann Arbor, Mich. Unit consists of a motor-driven suction and cleaning unit, a supporting stand, two roller cans and a means of quickly connecting or disconnecting cans to dust discharge of the air cleaner. The suction unit is placed on the stand with the two roller cans beneath. An expanding, gasketed sealing ring connects the cans to the discharge end of the cyclone separator.

Requiring 8 sq ft of floor space, system usually can be located immediately behind the source of the dust. Connection is made with flexible metal hose. Unit is rated at 1400 cfm on a single 6 in. inlet and will develop a static suction ranging up to 7.9 in. of water on a single 4 in. inlet. In operation, it draws dust, shavings, dirt, etc., through the paddle wheel fan and into the cyclone separator. Fine dust is taken out of the air stream by a spun glass filter.

Steel 1/20/47; *Item No.* 9985

Face and Knife Grinder

Achieving adjustable speed accurately controlled by a finger tip device working through an electronic panel, the type NT-20 face and knife grinder developed by Samuel C. Rogers & Co., Buffalo, N. Y., permits speed changes within range of 5



to 70 fpm while machine is running. Electronic drive not only holds cutting speed, but produces no noise or vibration and no shock at reversals. Table traverse is started by a button operating a direct-current motor which comes to preset speed smoothly. Grinder's 10 hp motor takes its power from any alternating current source, the electronic panel changing it to direct current. Table is 72 in. long and 16 in. wide. Grinding is done by a 20 in. cylinder grinding wheel.

Steel 1/20/47; *Item No.* 9055

Indoor Transformer

General Electric Co., Schenectady 5, N. Y., announces a 1200 v indoor current transformer designed for metering service on 3-wire, single-phase indoor circuits. Designated as Type JL-6, it is available in primary current ratings 10/10 to 400/400 and has a 30 kw full-wave rating. It is of wound-primary construction and has two primary coils for connection to a 3-wire circuit. Accuracy is maintained down to 5 per cent of the primary current rating. Mounting feet of transformer consist of two steel channel plates which extend its full length and are bolted to the core.

Steel 1/20/47; *Item No.* 9927

Offset Expansion Joint

Cook Electric Co., 2700 Southport, Chicago 14, announces a line of offset type packless expansion joints suitable for all piping conditions. Offset joint is constructed with an equal number of expansion flanges on either end of an insert section. Length of unit and number of flanges are determined by misalignment condition to be corrected. Joints are supplied with bellows flanges from any of the Magnilastic standard expansion joint series which includes pressures from vacuum to 1000 psi, pipe sizes from ½ to 24 in. and temperatures from minus 300 to plus 1600° F. Joints of stainless steel, Monel, Inconel and copper cover all common corrosive conditions. End fittings are available in welding end or Van Stone bolted flanges.

Steel 1/20/47; *Item No.* 9924

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9114	9110	9055
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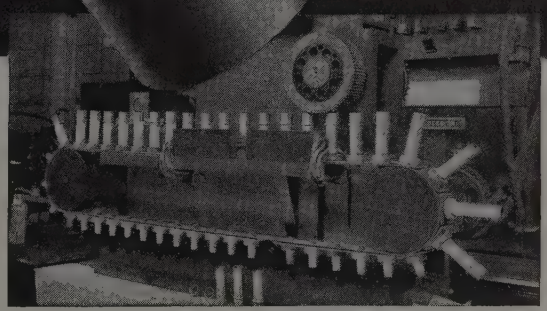

PRATT & WHITNEY Aircraft Division of United Aircraft Corporation reports these economies in the TOCCO-brazing of steel tips to bronze bodies of valve guide assemblies:

FORMER OUTPUT: 22 per hour per operator by manual brazing.

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PROCEDURE: The valve guide parts, fluxed and assembled with solder ring, are placed on pegs on a moving belt. This handling fixture passes the parts through an inductor coil where they are TOCCO-heated to 1200° F. and silver soldered . . . an automatic and continuous operation.

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Oxidation Resistant Alloys

(*Continued from Page* 68)

energy of formation of the oxide.

From a knowledge of the conductivity of the oxide and the relative mobilities of positive and negative ions, it is possible to calculate values of the constant k in equation (1) which are in good agreement with those experimentally determined. It follows from this work that the lower the electrical conductivity of the oxide, the lower the rate of scaling. Since the more refractory oxides have lower conductivity, those metals forming high-melting oxides are most useful as additions for conferring oxidation resistance.

In case of temperatures and times of oxidation yielding thin oxide films of thickness 0 to 2000 Angstrom units, the composition, the structure and the rate equations governing the growth of the films as well as the methods for measurement of the film weight and thickness may be quite different from the corresponding relations in case of the thicker films or scales discussed herein. Such films are of interest mainly in connection with corrosion studies. Qualitatively, it may be stated that rate of film formation in metals parallels the rate of scale formation.

Structure of Scales: Scales generally consist of a layer-like structure, each layer comprising an oxide phase stable at the reaction temperature. Thus on heating iron in air or oxygen at atmospheric pressure and temperature above 550° C, there appear in succession from the exterior of the scale layers of Fe_2O_3, Fe_3O_4 and FeO on the iron base, the surface of which is saturated with the quantity of oxygen soluble at the oxidation temperature. Relative thickness of each layer is governed by the relative diffusivities of iron ions in each phase. Thus, since the FeO layer possesses the highest conductivity, it constitutes 85-90 per cent of the total scale thickness, the Fe_3O_4 layer 10-15 per cent and Fe_2O_3 layer 0.5-2 per cent. The scale on removal from the base metal separates into three layers, the outer comprising the Fe_3O_4 and Fe_2O_3 layers, the other two the FeO layer with the line of separation at the original specimen surface[4].

In alloys, the added element may occur in the scale in several forms depending on its relative oxidizability with respect to the base metal. Thus, in case of small amounts of additions forming refractory oxides, such as aluminum, silicon and chromium to iron, the added element may occur in the inner (FeO) scale layer adjacent to the steel base either as a single oxide or as a double oxide with FeO. The concentration of such elements in the inner scale layer may be as much as four times their concentration in the alloy.

In the outer two scale layers, the added element may decrease to one-tenth its concentration in the base metal. With increase in content of such elements, their concentration in the inner scale layer rises continuously until the layer consists practically entirely of the refractory oxide with a correspondingly low diffusion rate. Marked improvement in oxidation rate is thus to be expected only when the scale adjacent to the metal consists entirely of such a refractory oxide. Price and Thomas[5], by preheating in a slightly oxidizing atmosphere copper containing an amount of aluminum insufficient to retard oxidation appreciably on heating in air, were able to form on the copper a layer of refractory aluminum oxide which effectively stopped further scaling on preheating in air.

In case of additions of metals less reactive with oxygen than the base metal, again the added metal is enriched in the scale layer adjacent to the metal surface; in this case, however, the added metal is reduced and occurs as fine metallic particles embedded in the scale. Thus in case of a 5 per cent nickel iron-nickel alloy, metallic particles containing 30 per cent or more nickel are found in the scale[6]. Similar precipitates occur in case of cobalt and copper additions. The scale structure is otherwise only slightly altered. Since refractory oxides are not formed by such additions, little improvement in oxidation resistance is likely to result.

Action of air on metals results not only in the formation of external scales but also in a diffusion of oxygen into the metal base with a resultant internal oxidation of the material. Steels containing chromium, aluminum or silicon form internal oxides of these elements (or their double oxides with FeO) embedded in the surface of the metal often at grain boundaries with resultant difficulty in subsequent pickling for the removal of scale[7]. In case of steels containing copper, diffusion of oxygen into the surface and formation of oxides with iron leads to precipitation of metallic copper at grain boundaries. In the presence of excessive amounts of sulphur in the steel, such liberation of copper may cause surface defects on hot-working[8].

Penetration of oxygen into the steel is considerably increased in case of nickel additions to the steel, 6 per cent nickel increasing the depth of internal oxidation about four times presumably as a result of higher solubility of oxygen in nickel steels. Cobalt and molybdenum additions behave similarly. Not only does the presence of such oxidized zones lead to difficulties in pickling but also surface cracking may result on hot-working.

Determination of Oxidation Resistance: A number of methods are available for

MAXIMUM TEMPERATURE OF STABILITY OF VARIOUS ALLOYS TO OXIDIZING ATMOSPHERES[24]

Material	Composition	Stable to °C in air
Copper		450
Iron		500
Brass	70% Cu, 30% Zn	700
Nickel		800
Chromium		900
Iron-Chromium Alloys	4-6% Cr, 0.1-0.2% C, 0.5% Mn, 0.5% Si, rest Fe	650
	8-10% Cr, 0.15% C max., 0.5% Mn, 0.5% Si, rest Fe	750
	12-14% Cr, 0.10% C max., 0.5% Mn, 0.5% Si, rest Fe	750/800
	16-18% Cr, 0.10% C, 0.5% Mn, 0.5% Si, rest Fe	850/900
	25-30% Cr, 0.10% C, 0.5% Mn, 0.5% Si, rest Fe	1050/1100
Iron-Chromium Nickel Alloys	17-19% Cr, 8-10% Ni, 0.5% Mn, 0.5% Si, 0.1% C, rest Fe	850/900
	17-19% Cr, 25-26% Ni, 0.5% Mn, 3.0% Si max., 0.2% C max., rest Fe	1050/1100
	22-28% Cr, 12-16% Ni, 0.5% Mn, 0.5% Si, 0.15% C max., rest Fe	1000
	24-26% Cr, 19-21% Ni, 0.75% Mn, 1.0% Si, 0.15% C max., rest Fe	1050/1100
	15-20% Cr, 30-35% Ni, 0.5-1.0% Mn, 1-2% Si, 0.15% C max., rest Fe	1050/1100
	14-18% Cr, 60-65% Ni, 1-2% Mn, 1.5-2% Si, 0.1-0.5% C, rest Fe	1000/1100
	12-20% Cr, 70-80% Ni, 2% Mn, 2% Si, 0.15% C, rest Fe	1100/1150
Chromium-Nickel Alloy	19-20% Cr, 77-79% Ni, 2.5% Mn, 0.5% Si, 0.25% C max., rest Fe	1150
Chromium-Aluminum	5-6.5% Cr, 0.6-0.8% Al, 0.45% Mn, 0.5% Si, 0.10% C, rest Fe	800
Iron Alloys	6.5-8.5% Cr, 1.2-2.0% Al, 0.45% Mn, 1.0% Si, 0.10% C, rest Fe	900
	12-15% Cr, 2.5-3.5% Al, 0.5% Mn, 0.5-1.0% Si, 0.12% C, rest Fe	900/1000
	18-20% Cr, 3-4% Al, 0.5% Mn, 0.5-1.0% Si, 0.12% C, rest Fe	1200
	20-22% Cr, 3-5% Al, 0.5-1.5% Mn, 0.5% Si, 0.10% C, rest Fe	1250/1300
	20% Cr, 5% Al, 1.5-3.0% Co, rest Fe	1150/1300
	30% Cr, 5% Al, 0.5% Mn, 0.5% Si, 0.1% C, rest Fe	about 1330

measuring the resistance of materials to attack by oxidizing atmospheres; the choice of method will depend on the particular application of the material and its physical form. Methods which have been used are listed below:

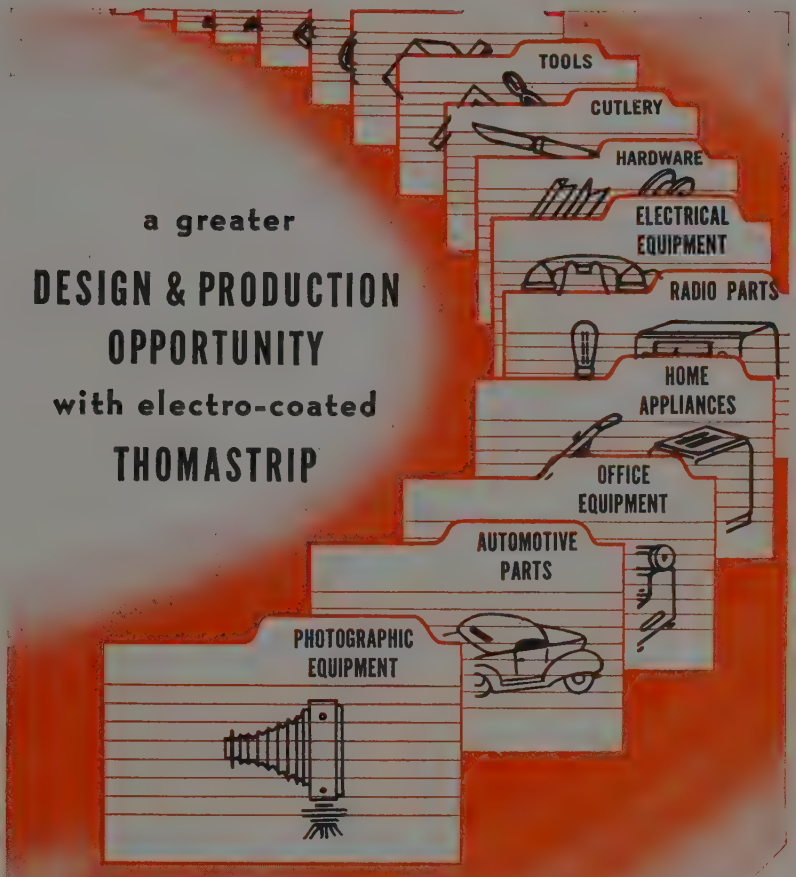
(1) Determination of weight increase of specimens after a given interval of exposure. Such a method is particularly applicable for continuous measurement of the course of oxidation and enables comparison of materials which are to be subjected to attack at a constant temperature.

(2) Determination of the decrease in weight on oxidizing and removing the external scale. This method is particularly useful in evaluating the effect of various furnace atmospheres on rate of metal loss, surface finish and ease of pickling.

(3) Measurement of the amount of gas consumed in the oxidation reaction. This, like method 1, is particularly applicable to continuous determination of the rate of attack.

(4) Determination of time necessary for the destruction of a given size of material. This has been extensively used as a test for heater element wire. Bash and Harsch[9] devised a method of testing which, with slight modification, has been adopted as the ASTM life test for electrical heating alloys. A 12 in. length of number 20-22 A.W.G. wire is suspended between a fixed upper clamp and a mercury cup. Current through the wire is so adjusted as to yield, depending on the alloy composition, a temperature of 2050-2150° F as measured by an optical pyrometer. The time required to burn out the wire with the current on 2 min and off 2 min is accepted as the life of the material. Wire life is comparatively unaffected by variation in size for gages larger than number 24 A.W.G. Of considerable effect are the actual and relative durations of heating and cooling. A 2 min on—2 min off cycle was found to be most injurious.

Rate of Oxidation of Alloys: It has been shown that the principal criterion for an oxidation-resistant alloy is the formation of an oxide scale of low electrical conductivity which, as has been shown above, indicates a low rate of metal ion diffusion. Equally important for high-temperature resistance is the melting-point of an oxide. In general the higher the melting-point of an oxide, the lower its conductivity. The presence of alloy elements in the base metal which form low-melting eutectics or compounds with other scale constituents must be avoided since molten scales give no protection. Thus the presence of 0.04 per cent boron in a 30 per cent chromium steel completely destroys scaling resist-



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ance at temperatures of 1200° C[10]. Likewise steels with more than 5 per cent silicon are useless above 1200° C because of the FeO-SiO_2 eutectic melting at 1240° C. In the following listing it may therefore be noted that those alloys are most oxidation-resistant which form refractory oxides.

Iron-Chromium Alloys: Most important component of heat-resistant alloys is chromium, both because it forms a highly refractory oxide and because its alloys with nickel and iron or both are workable at even high chromium contents. The effect of increasing chromium content on a 0.15 per cent carbon, 0.7-0.9 per cent silicon steel heated in air for 120 hours at various temperatures is shown in Fig. 1. It may be noted that at each temperature with increasing chromium content, the amount of scale decreases continuously to a low value after which with further chromium additions little improvement is obtained.

The chromium content at which low scaling rate is obtained denotes the composition at which the scale consists entirely of refractory Cr_2O_3; it may be noted that the chromium content of this composition increases with increasing temperature. Curves of the type shown in Fig. 1 are general for all alloy additions conferring oxidation resistance. For temperatures above 1000° C, alloys with 30 per cent chromium or more are necessary. The oxidation characteristics of iron-chromium alloys may still further be improved by additions of aluminum or silicon in amounts over 2 per cent[12].

Chromium-Nickel Alloys: It may be noted from Fig. 2 that improvement in the oxidation resistance of nickel occurs with chromium additions up to the solubility limit of chromium in nickel. Since technical chromium-nickel alloys practically always contain manganese or silicon which decrease the solubility of chromium in nickel, such alloys are limited to a maximum of 25 per cent chromium.

Carbon, by combining with chromium to form insoluable carbides, decreases the scaling resistance of nickel-chromium alloys. The life of an 80 per cent nickel, 20 per cent chromium alloy is halved by the presence of 0.30 per cent carbon[13]. Manganese also causes a slight increase in scaling rate while silicon and aluminum, even in amounts insufficient to reduce the workability appreciably, improve oxidation resistance. Tungsten and molybdenum, which may be added to improve high-temperature strength, have little effect on the scaling resistance[14].

Iron-Nickel-Chromium Alloys: Still more important as heat-resistant materials than the iron-chromium alloys are the iron-nickel-chromium alloys. The nickel in these alloys may, from the point of view of oxidation resistance, be considered as a diluent with little effect on the rate of scaling as shown in Fig. 3. Principal scale constituents formed on various alloys at 1000° C are plotted. The lines divide the composition range into three regions, the one at high chromium content denoting alloys with a weight increase on oxidation of less than 0.001 gm/cm² in 7½ hours at 1000° C, that at low chromium contents more than 0.01 gm/cm² and the intermediate region less than 0.01 gm/cm².

In the region of low weight increase predominantly Cr_2O_3 scales form, and NiO or Fe_2O_3 scales in the region of high weight increase. Nickel is only slightly more effective than iron in suppressing oxidation, chromium being mainly responsible for reducing the scaling attack.

Aluminum-Iron Alloys: Aluminum is the most effective addition for suppressing the scaling of iron. Thus Ziegler[16] showed that an 8 per cent aluminum alloy has the same oxidation resistance as an 80 per cent nickel, 20 per cent chromium alloy. Effect of increasing aluminum additions on scaling rate yields curves similar to those shown in Fig. 1 for chromium, larger concentrations of aluminum being required the higher the reaction temperature. Low oxidation rates are obtainable only when a white Al_2O_3 scale forms over the surface of the alloy. This alloy finds only limited application because of fabrication difficulty and because of its sensitivity to damage of the Al_2O_3 scale.

Aluminum-Chromium-Iron Alloys: Chromium is added to aluminum-iron alloys to improve their workability. Even in such alloys, aluminum is the most effective oxidation-restraining agent, minimum attack being noted[6] when the principal scale constituent is Al_2O_3. Optimum composition of such alloys lies in the range 20-30 per cent chromium and 3-8 per cent aluminum.

Iron-Silicon and Iron-Chromium-Silicon Alloys: Silicon behaves like aluminum in reducing the scaling of iron although it is somewhat less effective. Because of the low melting-point of the FeO-SiO_2 eutectic these alloys are not considered heat-resistant. Alloys containing 12-30 per cent chromium and 5-10 per cent silicon are quite scale-resistant, but like the iron-chromium-aluminum alloys present difficulties in working.

Copper-Base Alloys: Oxidation-resistant copper-base alloys are obtainable only when the low-melting, highly conductive copper oxide scale is replaced by a refractory oxide scale. Thus Dunn[17] showed that copper-zinc alloys are appreciably more resistant than copper only with zinc contents greater than 25 per cent when a ZnO scale forms. Frohlich[18] found aluminum, beryllium, magnesium and silicon additions afford real protection to copper, zinc and tin somewhat less, while iron, nickel, manganese, calcium, chromium and other elements afford none. The addition[19] of several per cent of beryllium, silicon or both to constantan (55 per cent copper, 45 per cent nickel) increases the alloy's maximum temperature of use from 600° C to 800° C.

Effect of Minor Impurities on Oxidation Resistance: Smithells, Williams, and Grimwood[20] found an appreciable effect of the purity of the initial materials on the life of nickel-chromium alloys. Thus alloys made of electrolytic chromium failed much more quickly than did those made of thermite chromium. This effect was further investigated by Hessenbruch[21] who found that by suitable additions, the life of various heat-resistant alloys could be prolonged as much as ten times. Thus additions of calcium, thorium and notably cerium in amounts less than 0.5 per cent improved scaling resistance to a degree out of all proportion to the amounts of added element. Such improvement was found to be general with additions of the alkali earths and rare earth elements.

Hessenbruch offered a tentative explanation of these results based on the observation that those elements which, when present in small amounts, prolonged the life of nickel-base alloys possessed atomic volumes greater than that of nickel oxide whereas those elements had no effect which had smaller atomic volumes. The role of such minor impurities is presumably to be considered as obstacles opposing the passage of nickel ions through the oxide scale.

Influence of Gas Atmosphere: In any discussion of the oxidation resistance of metals, the effect of gas atmosphere must be considered since the composition, pressure, and rate of flow of the atmosphere may affect the structure, composition and adherence of the oxide scale. Thus steel is oxidized at an increasing rate by atmospheres of carbon dioxide, dry air, oxygen and steam respectively. A steel to be stable in steam at 500° C must be resistant in air at 650° C and to withstand steam at 950° C must withstand air at 1200° C.

Oxidation of mild steel in air was shown by Hatfield[22] to be trebled by the addition of 5 per cent SO_2 and 5 per cent H_2O to the atmosphere and doubled by 5 per cent CO_2 and 5 per cent H_2O. Likewise the oxidation rate of 18-8 in air is increased ten times by the latter atmosphere, eight times by the former and seven times by 5 per cent H_2O. Griffiths[23] found the adherence of scale to steel to be markedly affected by gas composition and rate of heating and cool-

ng. The factors controlling the adherence of scales to metal surfaces have been only sparingly investigated. Nickel and alloys containing nickel are seriously embrittled by atmospheres containing sulphur compounds and the attack on copper-base alloys is greatly accelerated by atmospheres containing chlorine or its compounds.

Oxidation Stability of Alloys: Because of the marked effect of small amounts of impurities in the gas atmosphere and in the base metal and because of the sensitivity of scaling rate to factors such as heating cycles and rate of heating, it is impossible to state with certainty the range of stability of materials in oxidizing atmospheres. Any listing of alloys in their order of merit with respect to scaling must therefore be considered as comparative only for given atmospheres, heating and cooling cycles and other conditions. The temperature of stability in Fig. 4 is chosen as that temperature below which scaling losses are less than 0.0002-0.0004 gm/cm²/hour.

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Booklet Gives Elements of Engineering Program

Ten elements of an effective production engineering program are described in "Production Decalog", a 40-page booklet issued by George Fry & Associates Inc., consulting management engineers of New York and Chicago. An introduction to the problem is included in the first two sections.

The ten elements, each covered in detail, are supervisory training, plant layout, methods improvement, job evaluation, employee selection, employee training, work measurement, wage incentives, production control and cost control. The final section of the booklet is devoted to the services performed by the company.

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The Business Trend

Further Recovery Made In Industrial Pace

FURTHER recovery from the yearend letdown in industrial activity pushed STEEL's industrial production index for the week ended Jan. 11 up 16 points to 153 per cent of the 1936-1939 average of 100. The current level is only 2 points below that prevailing in the week before the yearend holiday season began and within 5 points of the postwar high of 158.

AUTOS—Much of the latest gain in the industrial pace came from increased production of automobiles, although the output of 78,329 passenger cars, trucks and busses in the week ended Jan. 11 still was considerably below the approximately 95,000 produced weekly before the yearend.

STEEL—Spurred by huge backlogs of orders for steel, particularly light gage flat-rolled products, the steel industry has pushed ingot production back up to around 90 per cent of capacity, with probability that the postwar high of 91.5 per cent set last November will be exceeded soon.

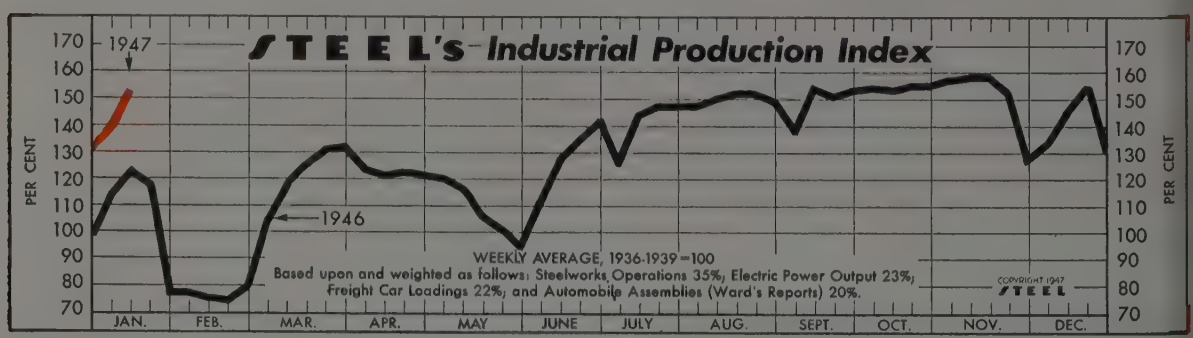
COAL—Also returning toward preholiday levels is bituminous coal output, which in the week ended Jan. 4 approximated 11,340,000 net tons, compared with 9,125,000 tons in the preceding week.

PRICES—For the second consecutive week, the wholesale price average of the U. S. Bureau of Labor Statistics showed a decline, the index for the week ended Jan. 4 being 139.1 per cent of the 1926 average of 100, compared with 139.6 in the week ended Dec. 28 and 139.8 in the week ended Dec. 21. Most of the latest decline resulted from lower prices for farm products and foods. Among groups showing increases were metal and metal products, building materials, and chemicals and allied products.

CARLOADINGS—Demands for maximum use of all available box cars will continue for the foreseeable future, the Association of American Railroads says. Despite fewer serviceable box cars than were available a year ago, current loadings of box cars and ton-miles of freight carried in these cars is greater than any previously recorded, the association reports.

FOREIGN TRADE—United States foreign trade was good last year but the International Trade Division of the U. S. Commerce Department expects 1947 to be even better because of a steady uptrend in world demand for goods, increasing availability of supplies, and steps now being taken to bring supply up into balance with demand. In 1946, the United States exported nearly $10 billion worth of goods and imported $5 billion worth. In 1947, exports are expected to exceed $11 billion, with imports reaching $6 billion.

INCOME PAYMENTS—A new high in income payments to individuals was set in November when the U. S. Commerce Department's seasonally adjusted index rose to 259.3 per cent of the 1935-1939 average of 100. The November payments approximated $14,248,000,000.



The Index (see chart above): **Latest Week (preliminary) 153** **Previous Week 137** **Month Ago 146** **Year Ago 123**

FIGURES THIS WEEK

INDUSTRY

	Latest Period*	Prior Week	Month Ago	Year Ago
Steel Ingot Output (per cent of capacity)†	90	88	72.5	82
Electric Power Distributed (million kilowatt hours)	4,853	4,574	4,778	4,163
Bituminous Coal Production (daily av.—1000 tons)	1,890	1,521	372	1,709
Petroleum Production (daily av.—1000 bbls.)	4,531	4,649	4,717	4,571
Construction Volume (ENR—Unit $1,000,000)	$90.4	$61.9	$126.9	$88.0
Automobile and Truck Output (Ward's—number units)	78,329	53,437	96,887	23,340

* Dates on request. † 1946 weekly capacity was 1,762,381 net tons.

TRADE

Freight Carloadings (unit—1000 cars)	850†	687	829	773
Business Failures (Dun & Bradstreet, number)	37	30	33	10
Money in Circulation (in millions of dollars)‡	$28,748	$28,951	$28,946	$28,297
Department Store Sales (change from like wk. a yr. ago)‡	+39%	+77%	+18%	—7

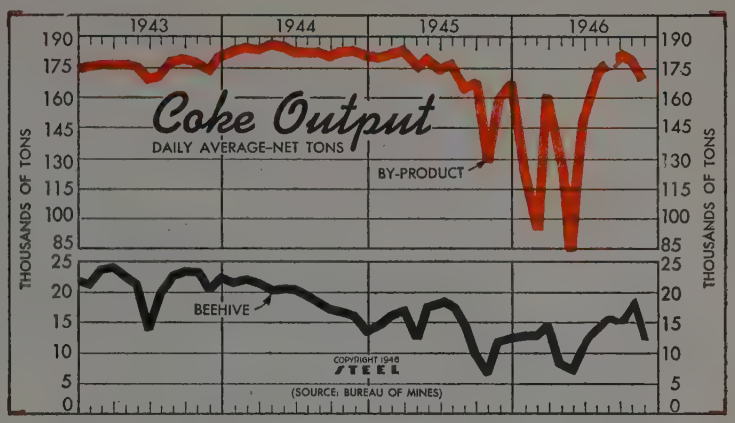
† Preliminary. ‡ Federal Reserve Board.

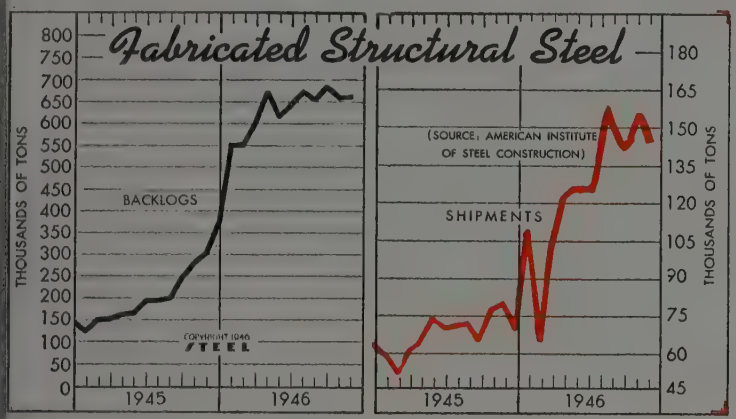
Coke Output

Bureau of Mines

(Daily Average—Net Tons)

	By-Product		Beehive	
	1946	1945	1946	1945
Jan.	122,570	179,879	13,069	14,745
Feb.	93,985	180,727	13,064	16,210
Mar.	161,290	182,120	14,897	17,115
Apr.	128,394	174,239	811	12,554
May	83,019	178,338	708	17,963
June	147,272	172,201	12,193	18,616
July	171,703	175,163	14,831	17,682
Aug.	176,193	163,567	16,317	14,669
Sept.	178,156	166,559	15,585	9,924
Oct.	177,817	127,173	17,954	6,407
Nov.	164,165	159,646	12,123	12,218
Dec.		166,648		12,659
Ave.		168,855		14,230





Fabricated Structural Steel

(000 Tons)

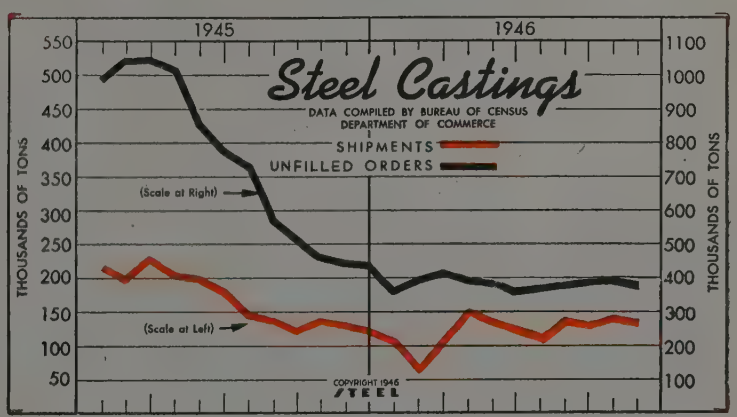
	Shipments			Backlogs		
	1946	1945	1944	1946	1945	1944
Jan.	107.5	57.0	35.2	552	124.4	113.1
Feb.	63.8	49.0	42.9	551	151.6	117.6
Mar.	102.8	59.5	41.4	605	153.3	106.3
Apr.	122.5	62.8	44.5	674	162.5	111.2
May	124.4	72.6	50.7	615	165.7	116.3
June	126.8	69.2	43.0	642	195.2	122.7
July	140.2	69.9	45.3	674	194.0	125.4
Aug.	157.5	70.6	55.2	651	201.1	130.4
Sept.	141.9	63.4	57.5	682	248.5	151.1
Oct.	152.3	76.6	61.6	660	282.8	174.4
Nov.	144.5	78.0	59.4	665	304.9	184.2
Dec.	....	68.8	61.3	...	375.2	142.5
Total	....	797.4	597.9	...	....	....

Commercial Steel Castings

(Net tons in thousands)

	Shipments		Unfilled Orders*	
	1946	1945	1946	1945
Jan.	99.1	210.2	358.9	983.1
Feb.	57.4	191.4	390.1	1,045.4
Mar.	101.4	222.6	412.3	1,047.7
Apr.	146.3	197.7	392.8	1,018.9
May	129.2	192.9	381.7	852.9
June	123.6	173.7	361.3	776.3
July	119.2	189.3	362.6	728.4
Aug.	130.4	131.4	374.7	565.6
Sept.	126.4	114.6	384.0	513.8
Oct.	138.2	130.3	389.0	460.3
Nov.	130.8	123.0	378.6	443.8
Dec.	....	115.2	....	434.3

*Castings for sale.



FINANCE

	Latest Period*	Prior Week	Month Ago	Year Ago
Bank Clearings (Dun & Bradstreet—millions)	$14,077	$12,212	$12,010	$13,171
Federal Gross Debt (billions)	$259.3	$259.5	$262.4	$278.6
Bond Volume, NYSE (millions)	$27.1	$33.6	$36.6	$50.6
Stocks Sales, NYSE (thousands)	5,146	5,157	8,400	22,290
Loans and Investments (billions)†	$56.2	$56.2	$57.6	$67.9
United States Gov't. Obligations Held (millions)†	$36,029	$35,837	$37,623	$48,674

† Member banks, Federal Reserve System.

PRICES

STEEL's composite finished steel price average	$68.45	$67.91	$64.73	$58.27
All Commodities†	139.1	139.6	139.1	106.8
Industrial Raw Materials†	153.1	154.2	154.4	119.7
Manufactured Products†	134.1	134.5	134.0	102.6

† Bureau of Labor Statistics Index, 1926=100.

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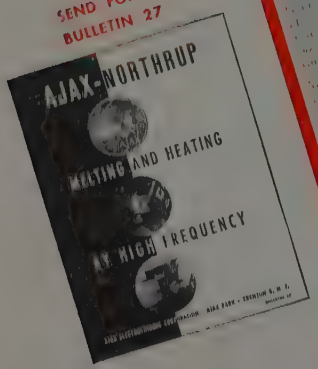

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Steel Producers Prepare Second Quarter Allotments

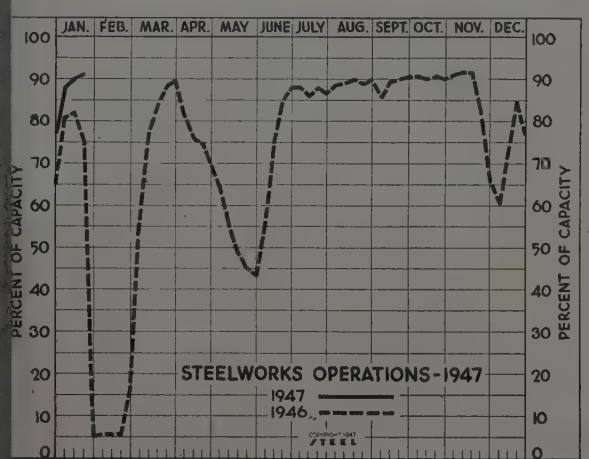
Schedules will be set up on basis of high production rates despite uncertainty regarding outcome of current negotiations on wages . . . Steel operating rate rises to 91 per cent of capacity

ESTABLISHMENT of sales quotas for the second quarter by a number of leading steel producers is expected to get underway within the next two weeks. In fact, it is believed that most of them, who are selling on a quarterly basis, will have allotments set up by Feb. 1 and regardless of whether or not wage negotiations between the larger producers and the steelworkers' union are completed by that time. Wage negotiations always carry a threat of a strike until agreement is finally reached.

However, most steel producers regard this threat as less menacing than upon some previous occasions and feel encouraged in going ahead with their plans for the second quarter. They feel that in any event that is the chance they will have to take, and if serious disruptions to production do develop they will make the necessary revisions in their quotas, as they have been forced to do upon many occasions in the past, especially since the end of the war.

Approach of time for setting up quotas for next quarter has stimulated considerable inquiry among consumers, who are checking with their suppliers for definite word as to prospects for their second quarter allotments. Further, buyers are reviewing their requirements with the idea of placing the proper emphasis on the specifications they need most in that period.

This is particularly true in light flat-rolled products such as sheets and strip, which continue especially scarce. Many consumers of these products have been able to get relatively little new tonnage since the first of the year because of the heavy unfilled orders that most mills were forced to carry over at the end of 1946. Some sellers had arrearages amounting to almost two months and this, combined with rated tonnage they had been forced to accept, has left relatively little capacity for new quotas.



DISTRICT STEEL RATES

Percentage of Ingot Capacity Engaged in Leading Districts

	Week Ended Jan. 18	Change	Same Week 1946	Same Week 1945
Pittsburgh	99	+ 1	56.5	88.5
Chicago	90	+ 0.5	64	98
Eastern Pa.	85	+ 3	78	94
Youngstown	85	+ 1	65	78
Wheeling	89	None	93	93.5
Cleveland	90.5	— 1.5	83	86
Buffalo	90.5	None	23.5	77
Birmingham	99	None	95	90
New England	80	— 4	80	92
Cincinnati	85	+ 5	81	92
St. Louis	72.5	None	63	75
Detroit	93	+ 1	88	83
Estimated national rate	91	+ 1	70	93.5

Based on weekly steelmaking capacity of 1,762,381 net tons for 1946; 1,831,636 tons for 1945; 1,791,287 tons for 1944.

However, as sheet mills were careful in limiting their new quotas for the current period—in fact, had revised them several times in some instances—they estimate that by the beginning of next quarter, provided there are no strikes, they will begin to cut into order backlogs markedly. This is not true in all instances.

New price schedules on most products have now been set up. However, there are still some steel specialties, including silicon sheets, on which action apparently remains to be taken. Moreover, some producers have not as yet followed through with formal schedules on certain revisions made in other quarters.

To reflect fully the wide range of prices being quoted on several products, STEEL's composite market price averages for finished steel for the first two weeks of the year have been revised to $68.59 and $69.14, respectively. It rose further last week to $69.36. The semifinished steel composite also continued to rise, being $52.10 last week compared with $51 for the preceding week and $41.60 for the first week of the year. Both scrap and pig iron markets held fairly steady, the respective averages holding at $31.17 and $29.56.

Although the shortage of pig iron is retarding steelmaking operations in some districts, the estimated national average rate rose one point further last week to 91 per cent of capacity, only one-half point under the 1946 high. Operations rose 5 points to 85 per cent in Cincinnati; 3 points to 85 per cent in eastern Pennsylvania; 1 point each to 85 per cent in Youngstown, 99 per cent in Pittsburgh, and 93 per cent in Detroit; and one-half point to 90 per cent in Chicago. Operations dropped 4 points to 80 per cent in New England and 1½ points to 90½ per cent in Cleveland while holding unchanged at 90.5 per cent in Buffalo, 89 per cent in Wheeling, 99 per cent in Birmingham, and 72.5 per cent in St. Louis.

COMPOSITE MARKET AVERAGES

	Jan. 18	Jan. 11	Jan. 4	One Month Ago Dec., 1946	Three Months Ago Oct., 1946	One Year Ago Jan., 1946	Five Years Ago Jan., 1942
Finished Steel	$69.36	°$69.14	°$68.59	$64.75	$64.45	$58.27	$56.73
Semifinished Steel	52.10	51.00	41.60	41.10	40.60	37.80	36.00
Steelmaking Pig Iron	29.56	29.56	29.56	29.10	27.50	24.75	23.00
Stelmaking Scrap	31.17	31.17	31.17	27.68	19.17	19.17	19.17

°Revised.

Finished Steel Composite:—Average of industry-wide prices on sheets, strips, bars, plates, shapes, wire, nails, tin plate, standard and line pipe. Semifinished Steel Composite:—Average of industry-wide prices on billets, slabs, sheet bars, skelp and wire rods. Steelmaking Pig Iron Composite:—Average of basic pig iron prices at Bethlehem, Birmingham, Buffalo, Chicago Cleveland, Neville Island, Granite City and Youngstown. Steelworks Scrap Composite:—Average of No. 1 heavy melting steel prices at Pittsburgh, Chicago and eastern Pennsylvania. Finished steel, net tons; others, gross tons.

COMPARISON OF PRICES

Representative Market Figures for Current Week; Average for Last Month, Three Months and One Year Ago

Finished material (except tin plate) and wire rods, cents per lb; coke, dollars per net ton; others, dollars per gross ton.

Finished Material

	Jan. 18, 1947	Dec., 1946	Oct., 1946	Jan., 1946
Steel bars, Pittsburgh	2.60c	2.55c	2.50c	2.25c
Steel bars, Philadelphia	2.98	2.91	2.86	2.57
Steel bars, Chicago	2.60	2.55	2.50	2.25
Shapes, Pittsburgh	2.50	2.35	2.35	2.10
Shapes, Philadelphia	2.64	2.48	2.48	2.215
Shapes, Chicago	2.50	2.35	2.35	2.10
Plates, Pittsburgh	2.65	2.50	2.50	2.25
Plates, Philadelphia	2.85	2.558	2.558	2.30
Plates, Chicago	2.65	2.50	2.50	2.25
Sheets, hot-rolled, Pittsburgh	2.50	2.48	2.425	2.20
Sheets, cold-rolled, Pittsburgh	3.20	3.19	3.275	3.05
Sheets, No. 10 galv., Pittsburgh	3.55	3.675	†4.05	†3.70
Sheets, hot-rolled, Gary	2.50	2.481	†2.425	†2.20
Sheets, cold-rolled, Gary	3.20	3.218	3.275	3.05
Sheets, No. 10 galv., Gary	3.55	3.675	†4.05	†3.70
Hot-rolled strip, Pittsburgh	2.50	2.462	2.35	2.10
Cold-rolled strip, Pittsburgh	3.20	3.162	3.05	2.80
Bright basic, bess, wire, Pittsburgh	3.425	3.05	3.05	2.75
Wire nails, Pittsburgh	4.125	3.75	3.75	2.90
Tin plate, per base box, Pittsburgh	$5.75	*$5.25	*$5.25	$5.00

* Nominal. † Base changed in December to 10 gage. ‡ Revised.

Semifinished Material

Sheet bars, Pittsburgh, Chicago	$58.00	$38.00	$38.00	$36.00
Slabs, Pittsburgh, Chicago	51.00	39.00	39.00	36.00
Rerolling billets, Pittsburgh	51.00	39.00	39.00	36.00
Wire rods ¼ to 9/32-inch, Pitts.	2.675c	2.425c	†2.30c	†2.15c

† Base changed in December.

Pig Iron

	Jan. 18, 1947	Dec., 1946	Oct., 1946	Jan., 1946
Bessemer, del. Pittsburgh	$31.83	$31.77	$29.77	$26.94
Basic, Valley	30.00	29.50	28.00	25.25
Basic, eastern del. Philadelphia	32.01	31.93	29.93	27.09
No. 2 fdry., del. Pgh, N. & S. sides	31.33	31.27	29.27	26.44
No. 2 fdry., del. Philadelphia	32.51	30.43	30.43	27.59
No. 2 foundry, Chicago	30.50	30.00	28.50	25.75
Southern No. 2, Birmingham	26.88	26.88	24.88	22.13
Southern No. 2, del. Cincinnati	*30.94	30.94	28.94	26.05
Malleable, Valley	30.50	30.00	28.50	25.75
Malleable, Chicago	30.50	30.00	28.50	25.75
Charcoal, low phos., fob Lyles, Tenn.	37.50	37.50	33.00	33.00
Gray forge, del. McKees Rocks, Pa.	30.66	30.61	28.61	25.80
Ferromanganese, fob cars, Pittsburgh	140.00	140.00	140.00	140.00

Scrap

Heavy melting steel, No. 1, Pittsburgh	$32.50	$28.50	$20.00	$20.00
Heavy melt, steel, No. 2, E. Pa.	31.00	27.38	18.75	18.75
Heavy melting steel, Chicago	30.00	27.188	18.75	18.75
Rails for rolling, Chicago	34.75	31.00	22.25	22.25
No. 1 cast, Chicago	42.50	36.875	25.00	20.00

Coke

Connellsville, furnace ovens	$8.875	$8.75	$8.75	$7.50
Connellsville, foundry ovens	9.875	9.50	9.50	8.25
Chicago, by-product fdry., del.	*16.10	15.288	15.10	13.75

* Plus Jan. 1 freight rate increase.

STEEL, IRON, RAW MATERIAL, FUEL AND METALS PRICES

Finished steel quoted in cents per pound and semifinished in dollars per gross ton, except as otherwise noted. Delivered prices do not include the 3 per cent federal tax on freight.

Semifinished Steel

Carbon Steel Ingots: Rerolling quality, standard analysis, price negotiated, fob mill. Copperweld Steel Co., electric furnace melted carbon ingots, $55-$60, Warren, O. Forging quality, $40, Pittsburgh, Chicago, Gary, Cleveland, Birmingham, Buffalo, Youngstown.

Alloy Steel Ingots: Pittsburgh, Chicago, Buffalo, Bethlehem, Canton, Massillon, Coatesville, uncrop. $48.69.

Rerolling Billets, Blooms, Slabs: Pittsburgh, Chicago, Gary, Cleveland, Buffalo, Sparrows Point, Birmingham, Youngstown, $42; Portsmouth Steel Corp., $55-$60, Portsmouth, O. Detroit, del., $44.50; Pac. ports (billets), $51.50.

Forging Quality Blooms, Slabs, Billets: Pittsburgh, Chicago, Gary, Cleveland, Buffalo, Birmingham, Youngstown, $50; Detroit, del., $52.50; forging billets fob Pac. ports, $59.50.

Alloy Billets, Slabs, Blooms: Pittsburgh, Chicago, Buffalo, Bethlehem, Canton, Massillon, $61; del. Detroit $63.50; eastern Mich. $64.50.

Sheet Bars: Pittsburgh, Chicago, Cleveland, Buffalo, Canton, Sparrows Point, Youngstown, $50; Portsmouth Steel Corp., $66 Portsmouth, O.

Skelp: Pittsburgh, Chicago, Sparrows Point, Youngstown, Coatesville, lb 2.35c.

Wire Rods: Pittsburgh, Chicago, Cleveland, Birmingham, ¼ to 9/32-in., inclusive, $2.55-$2.80 per 100 lb. Galveston base, $2.65. Worcester, add $0.10; Pacific ports, $0.535.

Bars

Hot-Rolled Carbon Bars and Bar-Size Shapes under 3-in.: Pittsburgh, Youngstown, Chicago, Gary, Cleveland, Buffalo, Birmingham base, 20 tons one size, 2.60c; Duluth, base, 2.60c; Detroit, del., 2.735c; eastern Mich., 2.785c; New York, del., 3.01c; Phila., del., 2.98c; Gulf ports, dock, 2.995c; Pac. ports, dock, 3.285c-3.56c.

Rail Steel Bars: Same prices as for hot-rolled carbon bars except base is 5 tons.

Hot-Rolled Alloy Bars: Pittsburgh, Youngstown, Chicago, Canton, Massillon, Buffalo, Bethlehem, base 20 tons one size, 3.05c; Detroit, del., 3.185c. (Texas Steel Co. uses Chicago base price as maximum fob Fort Worth, Tex., price on sales outside Texas, Oklahoma.)

Cold-Finished Carbon Bars: Pittsburgh, Chicago, Gary, Cleveland, Buffalo, base, 20,000-39,999 lb, 3.20c; Detroit, 3.25c; Toledo, 3.3c.

Cold-Finished Alloy Bars: Pittsburgh, Chicago, Gary, Cleveland, Buffalo, base, 3.80c; Detroit, del., 3.935c; eastern Mich., 3.985c.

Reinforcing Bars (New Billet): Pittsburgh, Chicago, Gary, Cleveland, Birmingham, Sparrows Point, Buffalo, Youngstown, base, 2.45c; Detroit, del., 2.585c; eastern Mich. and Toledo, 2.635c; Gulf ports, dock, 2.835c; Pacific ports, dock 2.885c.

Reinforcing Bars (Rail Steel): Pittsburgh, Chicago, Gary, Cleveland, Birmingham, Youngstown, Buffalo, base, 2.45c; Detroit, del., 2.585c; eastern Mich. and Toledo, del., 2.635c; Gulf ports, dock, 2.835c

Iron Bars: Single refined, Pitts., 6.15c; double refined, 7.00c; Pittsburgh, staybolt, 7.85c.

Sheets, Strip

Hot-Rolled Sheets: Pittsburgh, Chicago, Gary, Cleveland, Birmingham, Buffalo, Youngstown, Sparrows Point, Middletown, base, 2.50c; Detroit, del., 2.635c; eastern Mich., del., 2.685c; Philadelphia, del., 2.70c; New York, del., 2.79c; Pacific ports, 3.085c.

(Andrews Steel Co. quotes on Middletown, O., base for shipment to Detroit area: Alan Wood Steel Co., Conshohocken, Pa., quotes 3.25c, Sparrows Point Md., base; Granite City Steel Co., 2.875c, fob Granite City, Ill., 2.775c, fob Gary or Birmingham.)

Cold-Rolled Sheets: Pittsburgh, Chicago, Cleveland, Gary, Buffalo, Youngstown, Middletown, base, 3.20c; Granite City, base, 3.30c; Detroit, del., 3.335c; eastern Mich., del., 3.385c; New York, del., 3.61c; Philadelphia, del., 3.58c; Pacific ports, 3.885c

Galvanized Sheets, No. 10: Pittsburgh, Chicago, Gary, Birmingham, Youngstown, Sparrows Point, Middletown, base 3.55c; New York, del., 3.84c; Philadelphia, del., 3.75c; Pacific ports, 4.135c.

Corrugated Galvanized Sheets, No. 10: Pittsburgh, Chicago, Gary, Birmingham, base, 3.55c.

Culvert Sheets, No. 16, not corrugated, copper alloy: Pittsburgh, Chicago, Gary, Birmingham, 4.15c; Granite City, 4.25c; Pacific ports, 4.635c; copper iron 4.50c; pure iron, 4.50c.

Aluminized Sheets, No. 20 hot-dipped, coils or cut to lengths: Pittsburgh, 9.00c.

Long Ternes, No. 10: Pittsburgh, Chicago, Gary, base, 3.55c; Pacific ports, 4.335c.

Enameling Sheets, No. 12: Pittsburgh, Chicago, Gary, Cleveland, Youngstown, Middletown, base, 3.55c; Granite City, base, 3.65c; Detroit, del., 3.685c; eastern Mich., 3.735c; Pacific ports, 4.235c.

Electrical Sheets, No. 24:

	Pittsburgh Base	Pacific Ports	Granite City
Field grade	3.90c	4.685c	4.00c
Armature	4.25c	5.035c	4.35c
Electrical	4.75c	5.535c	4.85c
Motor	5.425c	6.21c	5.525c
Dynamo	6.125c	6.91c	6.225c
Transformer			
72	6.625c	7.41c	....
65	7.625c	8.41c	....
58	8.125c	8.91c	....
52	8.925c	9.71c	....

Rolled Strip: Pittsburgh, Chicago, Gary, eland, Birmingham, Youngstown, Middle- , base, 2.50c; Detroit, del., 2.635c; eastern ., del., 2.685c; Pacific ports, 3.185c. (Su- r Steel Corp., 3.30c, Pittsburgh.)

-Rolled Strip, 0.25 carbon and less: Pitts- h, Cleveland, Youngstown, 3.20c; Chicago, 3.30c; Detroit, del., 3.335c; eastern Mich., 5c; Wooster, base, 3.40c. (Superior Steel ., 4.70c, Pittsburgh.)

-Finished Spring Steel, 0.26-0.50 carbon: burgh, Cleveland, base, 3.03c; add 0.20c Worcester.

, Terne Plate

Plate: Pittsburgh, Chicago, Gary, Warren, 100-lb base box, $5.75; Granite City, Bir- gham, Sparrows Point, $5.85.

trolytic Tin Plate: Pittsburgh, Gary, War- O., 100-lb base box 0.25 lb tin, $4.85; 0.50 n, $5.05; 0.75 lb tin, $5.25; Granite City, ningham, Sparrows Point, $4.95, $5.15, 5, respectively.

Mill Black Plate: Pittsburgh, Chicago, , Warren, O., base 29-gage and lighter, ; Granite City, Birmingham, Sparrows t, 3.50c; Pacific ports, boxed 4.435c.

ufacturing Ternes (Special Coated): Pitts- h, Chicago, Gary, 100-base box, $4.90; ite City, Birmingham, Sparrows Point,).

ing Ternes: Pittsburgh base per package sheets; 20 x 28 in., coating I. C. 8-lb 50; 15-lb $15.50.

tes

on Steel Plates: Pittsburgh, Chicago, , Cleveland, Birmingham, Youngstown, rows Point, Coatesville, Claymont, Gen- Utah, 2.65c; New York, del. 2.94c; ., del., 2.85c; St. Louis, del., 2.74c; Bos- del., 2.86c; Pacific ports, 3.085-3.46c; Gulf , 2.885c.

tral Iron & Steel Co., Harrisburg, Pa., , basing points; Lukens Steel Co., Coates- Pa., Worth Steel Co., Claymont, Del., Wood Steel Co., Conshohocken, Pa., 2.80c, .)

r Plates: Pittsburgh, Chicago, 3.90c; Pa- ports, 4.435c; Gulf ports, 4.135c.

-Hearth Alloy Plates: Pittsburgh, Chi- , Coatesville, 3.787c; Gulf ports, 4.308c; fic ports, 4.525c.

Steel Plates: Coatesville, 10% cladding: el clad, 18.72c; inconel-clad, 26.00c; monel- 24.96c.

apes

ctural Shapes: Pittsburgh, Chicago, Gary, ingham, Buffalo, Bethlehem, Geneva, , 2.50c; New York, del., 2.70c; Phila., 2.64c; Pacific ports, 3.035-3.41c; Gulf , 2.735c.
oenix Iron Co., Phoenixville, Pa., 3.05c, lehem, Pa.)

Piling: Pittsburgh, Chicago, Buffalo, er 100 lb; Pacific ports, $3.585.

re and Wire Products

Pittsburgh, Chicago, Cleveland and Bir- gham per 100 pounds).

to Manufacturers in carloads
ht, basic or bessemer.....*$3.30-$3.55
g (except Birmingham)..... **$4.25

Products to Trade
s and Staples
dard and cement-coated.....†$3.75-$4.50
anized .....†$3.75-$4.50

, Merchant Quality
ealed (6 to 8 base)..... §$3.95
anized (6 to 8 base)..... §$4.40
Pittsburgh, Chicago, Cleveland, Birming- per base column)
en fence, 15 gage and heavier..... 84
ed wire, 80-rod spool..... 94
less wire, twisted 94
e posts 84
ties, single loop..... 86

Add $0.10 for Worcester, $0.05 for Duluth $0.535 for Pacific ports.
Add $0.10 for Worcester, $0.25 for Duluth Trenton, N. J., $0.535 for Pacific ports.
Add $0.30, Worcester, $0.535, Pacific ports.
Add $0.535 for Pacific ports.
Add $0.10, Worcester; $0.735, Pacific ports.

ils, Supplies

: Standard, over 60-lb, fob mill, $2.50 per lb. Light rails (billet), Chicago, Birming- $2.85 per 100 lb; Pittsburgh, del., *$2.875; Virginia Steel & Mfg. Co., $55 per net ton. Relaying, 35 lb and over, fob railroad and basing points, $31-$33 per net ton.

* Plus Jan. 1 freight rate increase.

Supplies: Track bolts, 6.50c; heat treated, 6.75c. Tie plates, $2.80 per 100 lb, fob mill. Splice bars, $3 per 100 lb. Standard spikes, 3.65c-4.50c; screw spikes, 5.30c-6.40c.

Tubular Goods

Pipe: Base price in carloads, threaded and coupled, to consumers about $200 per net ton. Base discounts on steel pipe Pittsburgh and Lorain, O.; Gary, Ind., 2 points less on lap weld and 1 point less on butt weld on sizes produced in that district. Pittsburgh base only on wrought iron pipe.

Butt Weld

Steel			Iron		
In.	Blk.	Gal.	In.	Blk.	Gal.
⅛	48	23	½	— 2	+20
¼ & ⅜	51	30½	¾	—11½	+10
½	55½	41	1-1¼	—17	+ 2
¾	58½	45	1½	—22½	— 1½
1-3	60½	47½	2	—23	— 2

Lap Weld

Steel			Iron		
In.	Blk.	Gal.	In.	Blk.	Gal.
			1¼	— 1	+20
2	53	39½	1½	— 7	+13
2½-3	56	42½	2	—14½	+ 5½
3½-6	58	44½	2½-3½	—17	+ 1½
*7&8	58	42½	4	—21	— 4
*9&10	57½	42	4½-8	—19	— 2½
*11&12	56½	41	9-12	—10	+ 7

* Not T. & C.

Seamless Steel

In.	Blk.	Gal.	In.	Blk.	Gal.
2	52	38½	* 7 & 8	57	42½
2½-3	55	41½	* 9 & 10	56½	42
3½-6	57	43½	*11 & 12	55½	41

* Not T. & C.

Boiler Tubes: Net base prices per 100 feet, fob Pittsburgh, in carload lots, minimum wall, cut lengths 4 to 24 feet, inclusive.

	——Seamless——		—Elec. Weld—	
O.D. Sizes	B.W.G.	Hot Rolled	Cold Drawn	Hot Rolled	Cold Drawn
1"	13	....	$10.89	$10.62	$10.62
1¼"	13	....	12.90	10.59	12.58
1½"	13	$12.00	14.26	11.70	13.90
1¾"	13	13.65	16.23	13.31	15.82
2"	13	15.29	18.17	15.00	17.95
2¼"	13	17.05	20.26	16.71	20.00
2¼"	12	18.78	22.31	18.38	22.00
2½"	12	20.57	24.43	20.11	24.07
2¾"	12	21.80	25.89	21.27	25.46
3"	12	22.87	27.18	22.26	26.68
3¼"	11	26.88	31.94	26.15	31.33
3½"	11	28.86	34.30	28.06	33.64
4"	10	35.82	42.55	34.78	41.68
4½"	9	47.48	56.42	....	....
5"	9	54.96	65.30	....	....
6"	7	84.38	100.25	....	....

Pipe, Cast Iron: Class B, 6-in. and over, $65 per net ton, Birmingham; $70, Burlington, N. J.; *$67.80, del., Chicago; 4-in. pipe, $5 higher, Class A pipe, $3 a ton over class B.

* Plus Jan. 1 freight rate increase.

Bolts, Nuts

Fob Pittsburgh, Cleveland, Birmingham, Chicago; add 15c per cwt, Lebanon, Pa. Additional discounts: 5 for carloads; 15 for full containers, except tire, step and plow bolts.

Carriage and Machine

½-in. and smaller; up to 6 in. in length	55 off
⅝ and ⅝, up to 6 in. in length	52 off
¾ x 6 in.	49 off
⅞ and 1 in. x 6 in. length	51 off
1⅛ in. and larger in all lengths and ⅞ in. and larger in lengths over 6 in.	48 off
½ in. and smaller, longer than 6 in.	45 off
Tire bolts	38½ off
Step bolts	46 off
Plow bolts	57 off

Stove Bolts

In packages, nuts separate, 60-10 off; bulk 74 off on 15,000 of 3-in. and shorter, or 5000 over 3-in., nuts separate.

Nuts

	A.S. Light	A. S. Reg. and Heavy
Semifinished hexagon	51 off	....
⅞-in. and smaller	....	48 off
½-in.-1-in.	48 off	....
⅛-in.-1-in.	....	47 off
1⅛-in.-1½-in.	46 off	45 off
1⅝-in. and larger	....	44 off

Additional discount of 15 for full containers.

Hexagon Cap Screws

Upset 1-in., smaller (10-20 bright)	56 off
Upset (10-35 heat treated)	
⅝ x 6	51 off
¾, ⅞ & 1 x 6	47 off

Square Head Set Screws

Upset 1-in. and smaller	61 off
Headless, ¼-in. and larger	46 off
No. 10 and smaller	56 off

Rivets

Fob Pittsburgh, Cleveland, Chicago Birmingham, Lebanon, Pa.

Structural	5.25c
⅞-inch and under	55-5 off

Washers, Wrought

Fob Pittsburgh, Chicago, Philadelphia, to jobbers and large nut and bolt manufacturers, lcl .....$1.50-2.00 off

Tool Steels

Tool Steel: Pittsburgh, Bethlehem, Syracuse, Canton, O., Dunkirk, N. Y., base, cents per lb; reg. carbon 15.15c; extra carbon 19.48c; special carbon 23.80c; oil-hardening 25.97c; high carbon-chromium 46.53c.

W	Cr	V	Mo	Base, per lb
18.00	4	1	....	72.49c
1.5	4	1	8.5	58.43c
....	4	2	3	58.43c
6.40	4.15	1.90	5	62.22c
5.50	4.50	4	4.50	75.74c

Stainless Steels

Base, Cents per lb

Grade	Bars, Drawn Wire, Structurals	Plates	Sheets	Hot Rolled Strip	Cold Rolled Strip
CHROMIUM NICKEL STEELS					
301	26.00c	29.50c	37.00c	22.00c	28.00c
302	26.00	29.50	37.00	23.50	30.50
303	28.50	31.50	39.00	29.50	36.00
304	27.50	31.50	39.00	25.50	32.50
308	31.50	37.00	44.50	31.00	38.00
309	39.00	43.50	51.00	40.50	51.00
310	53.50	56.50	57.50	53.00	61.00
316	43.50	48.00	52.00	43.50	52.00
321	31.50	37.00	44.50	32.00	41.50
347	36.00	41.50	49.00	36.00	45.50
431	21.00	24.00	31.50	19.00	24.50
440A	26.00	31.00	36.50	26.00	39.50
STRAIGHT CHROMIUM STEEL					
403	23.50	27.00	32.00	23.00	29.50
410	20.50	23.50	29.00	18.50	24.00
416	21.00	24.00	29.50	20.00	25.50
420	26.00	31.00	36.50	26.00	39.50
430	21.00	24.00	31.50	19.00	24.50
430F	21.50	24.50	32.00	20.50	27.00
442	24.50	28.00	35.50	26.00	35.00
443	24.50	28.00	35.50	26.00	35.00
446	30.00	33.00	39.50	38.00	56.50
*501	9.00	13.00	17.50	13.00	18.50
*502	10.00	14.50	18.50	14.50	19.50
†STAINLESS CLAD STEEL (20%)					
304	....	24.00	22.00	....	....
410	....	22.00	20.00	....	....
430	....	22.50	20.50	....	....
446	....	29.00	27.00	....	....

* Low chromium. † Fob Pittsburgh and Washington, Pa.; plate prices include annealing and pickling.

Metallurgical Coke

Price Per Net Ton

Beehive Ovens	
Connellsville, furnace	*$8.75-$9.00
Connellsville, foundry	9.75-10.00
New River, foundry	11.75
Wise county, foundry	9.00- 9.50
Wise county, furnace	8.50- 9.00
By-Product Foundry	
Kearney, N. J., ovens	15.35
Chicago, outside delivered	15.10
Chicago, delivered	16.10
Terre Haute, delivered	14.85
Milwaukee, ovens	15.85
New England, delivered	17.25
St. Louis, delivered	†15.10
Birmingham, delivered	12.25
Indianapolis, delivered	14.85
Cincinnati, delivered	14.60
Cleveland, delivered	14.50
Buffalo, delivered	14.75
Detroit, delivered	15.10
Philadelphia, ovens	14.50

* Operators of hand-drawn ovens using trucked coal, $9.35-$9.60.
† 15.68 from other than Ala., Mo., Tenn.

Coke By-Products

Spot, gal, freight allowed east of Omaha.

Pure and 90% benzol	15.00c
Toluol, two degree	22.00c
Industrial xylol	22.00c
Solvent naphtha	26.00c
Per pound fob works	
Phenol (car lots, returnable drums)	11.25c
Do., less than carlots	12.00c
Do., tank cars	10.25c
Eastern plants, per pound	
Naphthalene flakes, balls, bbl, to jobbers, "household use"	9.00c
Per ton, bulk, fob plants	
Sulphate of ammonia	$30.00

WAREHOUSE STEEL PRICES

Base delivered prices, cents per pound, for delivery within switching limits, subject to established extras. Quotations based on mill prices announ
March 1, 1946

	Hot-rolled bars†	Structural shapes†	Plates†	Floor plates†	Hot-rolled sheets† (10-gage base)	Hot-rolled strip† (14-gage and lighter, 6-in. and narrower)	Hot-rolled strip† (12-gage and heavier, wider than 6-inch)	Galvanized flat sheets (24-gage base)†	Cold-rolled sheets† (17-gage base)	Cold finished bars†	
Boston	4.356[1]	4.203[1]	4.203[1]	6.039[1]	4.050[1]	5.548[1]	4.418[2]	5.725[15]	5.031[14]	4.656[28]	4.6
New York	4.134[1]	4.038[1]	4.049[1]	5.875[2]	3.856[1]	4.375[1]	4.275[1]	5.501[13]	4.838[14]	4.584[28]	5.6
Jersey City	4.155[1]	4.018[1]	4.049[1]	5.875[1]	3.856[1]	4.375[1]	4.275[1]	5.501[13]	4.890[14]	4.605[28]	5.6
Philadelphia	4.114[1]	3.937[1]	3.875[1]	5.564[1]	3.774[1]	4.664[1]	4.554[1]	5.499[15]	5.189[26]	4.564[28]	5.6
Baltimore	4.093[1]	4.05[1]	3.865[1]	5.543[1]	3.64[1]	4.293[1]	4.193[1]	5.365[17]	5.118[26]	4.548[28]	
Washington	4.282[1]	4.22[1]	4.067[1]	5.632[1]	3.842[1]	4.432[1]	4.332[1]	5.667[17]	5.007[26]	4.582[28]	
Norfolk, Va.	4.377[1]	4.303[1]	4.262[1]	5.777[1]	4.037[1]	4.927[1]	4.477[2]	5.862[17]	4.552[26]	4.677[28]	
Bethlehem, Pa.*	...	3.70[1]									
Claymont, Del.*			3.70[1]								
Coatesville, Pa.*			3.70[1]								
Buffalo (city)	3.60[1]	3.65[4]	3.92[1]	5.55[1]	3.575[1]	4.21[1]	4.11[1]	5.20[15]	4.625[16]	4.20[28]	4.6
Buffalo (country)	3.50[1]	3.55[1]	3.55[1]	5.15[1]	3.475[1]	3.85[1]	3.750[1]	5.10[15]	4.525[16]	4.10[28]	4.6
Pittsburgh (city)	3.60[1]	3.65[1]	3.65[1]	5.25[1]	3.575[1]	3.95[1]	3.850[1]	5.327[15]	4.625[26]	4.20[28]	4.7
Pittsburgh (country)	3.50[1]	3.55[1]	3.55[1]	5.15[1]	3.475[1]	3.85[1]	3.750[1]	5.10[15]	4.525[26]	4.10[28]	4.6
Cleveland (city)	3.60[1]	3.88[1]	3.65[1]	5.48[1]	3.575[1]	3.95[1]	3.850[1]	5.347[15]	4.625[26]	4.20[28]	4.7
Cleveland (country)	3.50[1]		3.55[1]		3.475[1]	3.85[1]	3.750[1]		4.525[26]	4.10[28]	4.6
Detroit	3.785[1]	3.987[1]	3.935[1]	5.607[1]	3.710[1]	4.085[1]	3.985[1]	5.526[15]	4.760[26]	4.25[28]	4.6
Omaha (city, del.)	4.32[1]	4.37[1]	4.37[1]	5.97[1]	4.045[2]	4.52[1]	4.42[1]	6.00[15]	5.72[26]	4.945[28]	
Omaha (country)	4.22[1]	4.27[1]	4.27[1]	5.87[1]	3.945[1]	4.42[1]	4.32[1]	5.90[15]			
Cincinnati	3.902[1]	3.983[1]	3.952[1]	5.583[1]	3.671[1]	4.046[1]	3.946[1]	5.296[15]	4.271[26]	4.602[28]	
Youngstown*								4.85[15]			
Middletown, O.*					3.475[1]	3.85[1]	3.750[1]	5.10[15]			
Chicago (city)	3.75[1]	3.80[1]	3.80[1]	5.40[1]	3.475[1]	3.95[1]	3.850[1]	5.40[15]	4.425[26]	4.20[28]	4.6
Milwaukee	3.908[1]	3.958[1]	3.958[1]	5.558[1]	3.633[1]	4.108[1]	4.008[1]	5.558[15]	4.583[26]	4.358[28]	5.6
Indianapolis	3.88[1]	3.88[1]	3.88[1]	5.48[1]	3.748[1]	4.118[1]	4.018[1]	5.368[15]	4.798[26]	4.48[28]	5.6
St. Paul	4.092[3]	4.142[3]	4.142[3]	5.742[3]	3.817[3]	4.292[3]	4.192[3]	5.666[15]	4.767[26]	4.852[28]	5.4
St. Louis	3.918[1]	3.968[1]	3.968[1]	5.568[1]	3.643[1]	4.118[1]	4.018[1]	5.622[15]	4.596[26]	4.522[28]	5.5
Memphis, Tenn.	4.296[1]	4.346[2]	4.346[1]	6.071[1]	4.221[1]	4.596[1]	4.496[2]	5.746[15]		4.821[28]	
Birmingham	3.75[1]	3.80[1]	3.80[1]	6.158[1]	3.675[1]	4.05[1]	4.05[1]	5.20[15]	5.077[26]	4.99[28]	5.4
New Orleans (city)	4.358[1]	4.408[1]	4.408[1]	6.329[2]	4.283[1]	4.658[1]		5.808[15]	5.304[26]	5.079[28]	
Houston, Tex.	4.00[3]	4.50[1]	4.50[1]	5.75[3]	3.988[3]	4.668[3]	4.568[3]	5.763[26]	5.819[26]	4.10[28]	
Los Angeles	4.65[4]	4.70[4]	5.80[4]	7.05[4]	4.95[4]	5.80[4]	5.200[4]	6.55[13]	6.60[6]	6.105[28]	5.5
San Francisco	4.235[7]	4.185[7]	4.185[7]	5.885[7]	4.16[7]	5.885[1]	4.535[1]	6.385[15]	6.91[15]	5.783[28]	7.2
Portland, Oreg.	4.70[27]	4.70[27]	5.00[27]	6.75[27]	4.875[27]	6.65[27]	5.000[27]	6.20[15]	6.825[15]	5.982[15]	
Tacoma, Wash.	4.60[6]	4.70[6]	5.00[6]	6.75[6]	4.87[6]	5.80[6]	4.60[6]	6.40[15]	6.55[15]	6.23[28]	
Seattle	4.60[6]	4.70[6]	5.00[6]	6.75[6]	4.87[6]	5.80[6]	4.60[6]	6.40[15]	6.55[15]	6.23[28]	

* Basing point cities with quotations representing mill prices, plus warehouse spread.

† Prices nominal pending establishment of new quotations to reflect mill increases and higher freight rates.

BASE QUANTITIES

[1]—400 to 1999 pounds; [2]—400 to 14,999 pounds; [3]—any quantity; [4]—300 to 1999 pounds; [5]—400 to 8999 pounds; [6]—300 to 9999 pounds; [7]—400 to 39,999 pounds; [8]—under 2000 pounds; [9]—under 4000 pounds; [10]—500 to 1499 pounds; [11]—one bundle to 39,999 pounds; [12]—150 to 2249 pounds; [13]—150 to 1499 pounds; [14]—three to 24 bundles; [15]—450 to 1499 pounds; [16]—one bundle to 1499 pounds; [17]—one to nine bundl [18]—one to six bundles; [19]—100 to 749 pounds; [20]—800 to 1999 poun [21]—1500 to 39,999 pounds; [22]—1500 to 1999 pounds; [23]—1000 39,999 pounds; [24]—400 to 1499 pounds; [25]—1000 to 1999 poun [26]—under 25 bundles. Cold-rolled strip, 2000 to 39,999 pounds, ba [27]—300 to 4999 pounds.

ORES

Lake Superior Iron Ore
Gross ton, 51½% (Natural)
Lower Lake Ports

Old range bessemer	$5.45
Old range nonbessemer	5.30
Mesabi bessemer	5.20
Mesabi nonbessemer	5.05
High phosphorus	5.05

Eastern Local Ore
Cents, units, del. E. Pa.

Foundry and basic 56-63% contract	18.00

Foreign Ore
Cents per unit, c/f Atlantic ports

Manganiferous ore, 45-55% Fe., 6-10% Mn.	Nom.
N. African low phos.	Nom.
Swedish basic, 60 to 68%	18.00
Spanish, No. African basic, 50 to 60%	Nom.
Brazil iron ore, 68-69% fob Rio de Janeiro	7.50–8.00

Tungsten Ore

Chinese Wolframite, per short ton unit, duty paid	$24.00

Chrome Ore
Gross ton fob cars, New York, Philadelphia, Baltimore, Charleston, S. C., Portland, Oreg., or Tacoma, Wash.
(S S paying for discharge; dry basis, subject to penalties if guarantees are not met.)

Indian and African

48% 2.8:1	$39.75
48% 3:1	41.00
48% no ratio	31.00

South African (Transvaal)

44% no ratio	$27.40
45% no ratio	28.30
48% no ratio	31.00
50% no ratio	32.30

Brazilian—nominal

44% 2.5:1 lump	$33.65
48% 3:1 lump	48.50

Rhodesian

45% no ratio	$28.30
48% no ratio	31.00
48% 3:1 lump	41.00

Domestic (seller's nearest rail)

48% 3:1	$43.50

less $7 freight allowance.

Manganese Ore

Sales prices of Office of Metals Reserve, cents per gross ton unit, dry, 48%, at New York, Philadelphia, Baltimore, Norfolk, Mobile and New Orleans, 85c; Fontana, Calif., Provo, Utah, and Pueblo, Colo., 91c; pr include duty on imported ore are subject to established premiu penalties and other provisions. P at basing points which are points of discharge of imported m ganese ore is fob cars, shipside, dock most favorable to the bu Outside shipments direct to sumers at 15c to 17c per unit than Metal Reserve prices.

Molybdenum

Sulphide conc., lb., Mo. cont., mines	$

NATIONAL EMERGENCY STEELS (Hot Rolled)

(Extras for alloy content)

Designation	Chemical Composition Limits, Per Cent — Carbon	Mn	Si	Cr	Ni	Mo	Basic open-hearth Electric furn: Bars per 100 lb	Billets per GT	Bars per 100 lb	Bi per
NE 9415	.13-.18	.80-1.10	.20-.35	.30-.50	.30-.60	.08-.15	$0.812	$16.230	$1.353	$27
NE 9425	.23-.28	.80-1.20	.20-.35	.30-.50	.30-.60	.08-.15	.812	16.230	1.353	27
NE 9442	.40-.45	1.00-1.30	.20-.35	.30-.50	.30-.60	.08-.15	.866	17.312	1.407	28
NE 9722	.20-.25	.50-.80	.20-.35	.10-.25	.40-.70	.15-.25	.703	14.066	1.244	24
NE 9912	.10-.15	.50-.70	.20-.35	.40-.60	1.00-1.30	.20-.30	1.298	25.968	1.677	33
NE 9920	.18-.23	.50-.70	.20-.35	.40-.60	1.00-1.30	.20-.30	1.298	25.968	1.677	33

Extras are in addition to a base price of 2.921c per pound on finished products and $58.43 per gross on semifinished steel major basing points and are in cents per pound and dollars per gross ton. No prices qu on vanadium alloy.

PIG IRON

ices per gross ton. Minimum delivered prices do not include 3 per federal tax.

	No. 2 Foundry	Basic	Bessemer	Malleable
lehem, Pa., base	$31.50	$31.00	$32.50	$32.00
wark, N. J., del.	33.34	32.84	34.34	35.54
ooklyn, N. Y., del.	34.50	....	....	35.00
sboro, Pa., base	31.50	31.00	32.50	32.00
ingham, base	26.88	25.50	31.50	....
ltimore, del.	33.28	....	....	....
ston, del.	*31.62	....	....	....
icago, del.	*30.72	....	....	....
ncinnati, del.	*30.94	*30.06	....	....
eveland, del.	*30.62	*29.74	....	....
wark, N. J., del.	32.96	....	....	....
iladelphia, del.	32.13	31.63	....	....
Louis, del.	*30.62	*31.54	....	....
alo, base	30.50	30.00	31.50	31.00
ston, del.	36.98	36.48	37.98	37.48
chester, del.	32.34	31.84	33.34	32.84
racuse, del.	33.00	32.50	34.00	33.50
ago, base	30.50	30.00	31.00	30.50
lwaukee, del.	31.82	31.32	32.32	31.82
uskegon, Mich., del.	34.33	....	....	34.33
eland, fob furnace	30.50	30.00	31.00	30.50
kron, Canton, del.	32.17	31.67	32.67	32.17
roit, base	30.50	30.00	31.00	30.50
ginaw, Mich., del.	33.67	33.17	34.17	33.67
ith, base	31.00	30.50	31.50	31.00
Paul, del.	*33.13	*32.63	*33.63	*33.13
, Pa., base	30.50	30.00	31.50	31.00
rett, Mass., base	29.50	29.00	30.50	30.00
ston, del.	30.00	29.50	31.00	30.50
nite City, Ill., base	30.50	30.00	31.00	30.50
Louis, del.	*31.00	*30.50	....	*31.00
lle Island, Pa., base	30.50	30.00	31.00	30.50
ttsburgh, del., N.&S. sides	31.33	30.83	31.83	31.33
o, Utah, base	28.50	28.00	....	....
rpsville, Pa., base	30.50	30.00	31.00	30.50
lton, Pa., base	31.50	31.00	32.50	32.00
dland, Pa., base	31.50	31.00	32.50	32.00
iladelphia, del.	32.51	32.01	....	33.01
do, O., base	30.50	30.00	31.00	30.50
ncinnati, del.	*33.78	*33.26	*34.26	*33.78
ngstown, O., base	30.50	30.00	31.00	30.50
nsfield, O., del.	33.48	32.98	33.98	33.48

Plus Jan 1 freight rate increase.
To Neville Island base add: 66c for McKees Rocks, Pa.; $1.01 renceville, Homestead, McKeesport, Ambridge, Monaco, Aliquippa; (water), Monongahela; $1.33, Oakmont, Verona; $1.49 Brackenridge. xceptions to above prices: Kaiser-Frazer Parts Corp., Struthers, O., rges 50 cents a ton in excess of basing point prices for No. 2 ndry, basic, bessemer and malleable pig iron.

High Silicon Silvery

6.00-6.50 per cent (base)	$36.00
6.51-7.00	37.00
7.01-7.50	38.00
7.51-8.00	39.00
8.01-8.50	40.00
8.51-9.00	41.00
9.01- 9.50	42.00
9.51-10.00	43.00
10.01-10.50	44.00
10.51-11.00	45.00
11.01-11.50	46.00

Fob Jackson, O., per gross ton. Buffalo base $1.25 higher. Buyer may use whichever base is more favorable.

Electric Furnace Ferrosilicon: Si 14.01-14.50%, $52.75, Jackson, O.; $56 Keokuk, Iowa; $54, Buffalo and Niagara Falls, N. Y. Add $1 a ton for each additional 0.5% Si to 18%; 50c for each 0.5% Mn over 1%; $1 a ton for 0.045% max. phos.

Bessemer Ferrosilicon

Prices same as for high silicon silvery iron, plus $1 per gross ton.

Charcoal Pig Iron

Semi-cold blast, low phosphorus. Fob furnace, Lyles, Tenn. $37.50 (For higher silicon irons a differential over and above the price of base grade is charged as well as for the hard chilling iron, Nos. 5 and 6.)

Gray Forge

Neville Island, Pa. $30.00

Low Phosphorus

Steelton, Pa., Buffalo, Troy, N. Y., Birdsboro, Pa., $36, base; Philadelphia, $37.49, del. Intermediate phosphorus, Central furnace, Cleveland, $33.

Differentials

Basing point prices are subject to following differentials:

Silicon: An additional charge not to exceed 50 cents a ton for each 0.25 per cent silicon in excess of base grade (1.75% to 2.25%).

Phosphorus: A reduction of 38 cents a ton for phosphorus content of 0.70 per cent and over.

Manganese: An additional charge not to exceed 50 cents a ton for each 0.50 per cent, or portion thereof, manganese in excess of 1%.

Nickel: An additional charge for nickel content as follows: Under 0.50%, no extra; 0.50% to 0.74%, inclusive, $2 a ton; for each additional 0.25% nickel, $1 a ton.

Refractories

Per 1000, fob shipping point
Net Prices

Fire Clay Brick

Super Duty

Pa., Mo., Ky.	$81.00

High Heat Duty

Pa., Ill., Md., Mo., Ky.	65.00
Ala., Ga.	65.00
N. J.	70.00

Intermediate Heat Duty

Ohio	57.00
Pa., Ill., Md., Mo., Ky.	59.00
Ala., Ga.	51.00
N. J.	62.00

Low Heat Duty

Pa., Md., Ohio	51.00

Malleable Bung Brick

All bases	75.00

Ladle Brick

(Pa., O., W. Va., Mo.)

Dry Press	42.00
Wire Cut	40.00

Silica Brick

Pennsylvania	65.00
Joliet, E. Chicago	74.00
Birmingham, Ala.	65.00

Magnesite

Domestic dead-burned grains, net ton, fob Chewelah, Wash.

Bulk	22.00
Bags	26.00

Basic Brick

Net ton, fob Baltimore, Plymouth Meeting, Chester, Pa.

Chrome brick	54.00
Chem. bonded chrome	54.00
Magnesite brick	76.00
Chem. bonded magnesite	65.00

Fluorspar

Metallurgical grade, fob shipping point in Ill., Ky., net tons, carloads, effective CaF_2 content, 70% or more, $33; 65% to 70%, $32; 60% to 65%, $31; less than 60%, $30.

Open Market Prices of Leading Ferroalloy Products

geleisen: 19-21% carlot per s ton, Palmerton, Pa., $40; sburgh, $40.50; Chicago, $40.60.

romanganese, standard: 78-82% gross ton, duty paid, $135 fob s, Baltimore, Philadelphia or v York, whichever is most favore to buyer, Birmingham, Ala. here Sloss-Sheffield Steel & Iron is producer); $140 fob cars, tsburgh, including 50c switching rge, (where Carnegie - Illinois el Corp. is producer); add $8 for ked c.l., $10 for ton, $13.50 for s ton; $1.70 for each 1%, or ction contained manganese over % or under 78%.

romanganese, low carbon: Eastzone: Special, 21c; regular, 50c; medium, 14.50c; central n e: special, 21.30c; regular, 80c; medium, 14.80c; western e: Special, 21.70c; regular, 21.20c; dium, 15.20c. Prices are per pound tained Mn, bulk carlot shipments, shipping point, freight allowed. cial low-carbon has content of % Mn, 0.10% C, and 0.06%

romanganese Briquets: (Weight prox. 3 lb and containing exactly lb Mn) Prices per lb of briquets: ntract, carlots, bulk 6.40c, packed 0c, tons 7.30c, less 7.70c, eastern, ight allowed; 6.65c, 7.15c, 7.90c i 8.30c, central; 7.20c, 7.70c, 0c and 10.20c, western; spot up 5c; notched up 0.25c.

rrotungsten: Spot, 10,000 lb or re, per lb contained W, $1.90; ntract, $1.88; freight allowed as west as St. Louis.

rrotitanium: 40-45%, R.R. freight owed, per lb contained Ti; ton s $1.23; less-ton lots $1.25; east-n. Spot up 5c per lb.

rrotitanium: 20-25%, 0.10 maximum C; per lb contained Ti; ton lots $1.35; less-ton lots $1.40 eastern. Spot up 5c per lb.

Ferrotitanium, High-Carbon: 15-20% contract basis, per net ton, fob Niagara Falls, N. Y., freight allowed to destination east of Mississippi river and north of Baltimore and St. Louis, 6.8% C $142.50; 3-5% C $157.50.

Ferrovanadium: V 35-55%, contract basis, per lb contained V, fob producers plant with usual freight allowances; open-hearth grade $2.70; special grade $2.80; highly-special grade $2.90.

Ferromolybdenum: 55-75% per lb, contained Mo, fob Langeloth and Washington, Pa., furnace, any quantity 95.00c.

Ferrophosphorus: 17-19%, based on 18% P content with unitage of $3 for each 1% of P above or below the base; gross tons per carload fob sellers' works, with freight equalized with Rockdale, Tenn.; contract price $58.50, spot $62.25.

Ferrosilicon: Contract, lump, packed; eastern zone quotations: 90-95% c.l. 12.95c, ton lots 13.45c, smaller lots 13.95c; 80-90%, c.l. 11.35c, ton lots 11.90c, smaller lots 12.45c; 75%, c.l. 10.15c, ton lots 10.75c, smaller lots 11.35c; 50% c.l. 8.45c, ton lots 9.10c, smaller lots 9.75c. Deduct 1.0c for bulk carlots 75%, 80-90%, 90-95%. Prices are fob shipping point, freight allowed, per lb of contained Si. Spot prices 0.25c higher on 80-90%, 0.30c on 75%, 0.45c on 50%.

Ferroboron: (B 17.50% max. and C 1.50% max., Al 0.50% max. and C 0.50% max.) Prices per lb of alloy, contract, ton lots $1.20, less ton lots $1.30, eastern, freight allowed; $1.2075 and $1.3075 central; $1.229 and $1.329, western; spot add 5c.

Ferrocolumbium: 50-60%, per lb contained columbium in gross ton lots, contract basis, R. R. freight allowed, eastern zone, $2.50; less ton lots $2.55. Spot up 10c.

Ferrochrome: Contract, lump, packed; **high carbon,** eastern zone, c.l. 16.20c, ton lots 16.80c; central zone, add 0.40c and 1.30c; western zone, add 0.55c and 2.10c. Deduct 0.60c for bulk carlots.

High carbon, high nitrogen, add 5c to all high carbon ferrochrome prices. Deduct 0.55c for bulk carlots. Spot prices up 0.25c.

Low carbon, eastern zone, bulk, c.l., max. 0.06% C 23c; 0.1% 22.50c, 0.15% 22c, 0.2% 21.50c, 0.5% 21c, 1% 20.50c, 2% 19.50c; add 1c for 2000 lb to c.l.; central zone, add 0.4c for bulk, c.l., and 0.65c for 2000 lb to c.l.; western zone, add 0.5c for bulk, c.l., and 1.85c for 2000 lb to c.l.; carload packed differential 0.45c. Prices are per pound of contained Cr, fob shipping points.

Low carbon, high nitrogen: Add 2c to low carbon ferrochrome prices. For higher nitrogen low carbon, add 2c for each 0.25% of nitrogen over 0.75%.

Ferrochrome, Special Foundry: (Cr 62-66%, C above 5-7%.) Contract, 2-inch x D, packed, eastern zone, freight allowed, c.l. 17.05c, ton lots 17.60c, less than ton 18.30c; central zone, add 0.40c for c.l. and 1.30c for smaller lots; western zone, add 0.55c for c.l. and 2.10c for smaller lots. Deduct 0.60c for bulk carlots.

S. M. Ferrochrome, high carbon: (Cr 60-65%, Si, Mn and C 4-6% each.) Contract, lump, packed, eastern zone, freight allowed, c.l. 17.30c, ton lots 17.90c, less than ton 18.60c; central zone, add 0.40c for c.l. and 1.30c for smaller lots; western zone, add 0.55c for c.l. and 2.10c for smaller lots. Prices are per pound of contained chromium, spot prices 0.25c higher. Deduct 0.60c for bulk carlots.

S. M. Ferrochrome, low carbon: (Cr 62-66%, Si 4-6%, Mn 4-6% and C 1.25% max.) Contract, carlot, bulk 20.00c, packed 20.15c; ton lots 21.00c, less ton lots 22.00c, eastern, freight allowed, per pound contained Cr; 20.40c, 20.50c, 20.95c and 22.65c, central; 21.00c, 21.45c, 22.85c and 23.85c, western; spot up 0.25c.

Ferrochrome Briquets: Containing exactly 2 lb Cr, packed eastern zone, c.l. 10.35c, ton lots 10.75c, less than ton 11.15c; central zone, add 0.25c for c.l. and 0.90c for smaller lots; western zone, add 0.55c for c.l. and 2.10c for smaller lots. Deduct 0.50c for bulk carlots. Prices per pound of briquets; spot prices 0.25c higher; notched, 0.25c higher.

Chromium Metal: 97% min. Cr, max. 0.50% C, eastern zone, per lb contained Cr bulk, c.l. 79.50c, 2000 lb to c.l. 80c; central 81c and 82.60c; western 82.25c and 84.75c, fob shipping point, freight allowed.

Chromium-Copper: (Cr 8-11%, Cu 88-90%, Fe 1% max., Si 0.50% max.) Contract, any quantity, 45c, eastern, Niagara Falls, N. Y., basis, freight allowed to destination, except to points taking rate in excess of St. Louis rate to which equivalent of St. Louis rate will be allowed; spot up 2c.

Calcium metal; cast: Contract, ton lot or more, $1.60; 100 to 1999 lb, $1.95; less than 100 lb, $3.15 per lb of metal, eastern zone; $1.615, $1.965 and $3.185, western; spot up 5c.

Calcium-Manganese-Silicon: (Ca 16-20%, Mn 14-18% and Si 53-59%), per lb. of alloy. Contract, carlots, 15.50c, ton lots 16.50c and less 17.00c, eastern, freight allowed; 16.00c, 17.35c, and 17.85c, central;

18.05c, 19.10c and 19.60c western; spot up 0.25c.

Calcium - Silicon: (Ca 30-35%, Si 60-65% and Fe 3.00% max.), per lb of alloy. Contract, carlot, lump 13.00c, ton lots 14.50c, less 15.50c, eastern, freight allowed; 13.50c, 15.25c and 16.25c central; 15.55c, 17.40c and 18.40c, western; spot up 0.25c.

Silicon Metal: Min. 97% Si and max. 1% Fe, eastern zone, bulk, c.l. 13.65c; 2000 lb to c.l., 15.05c; central zone, 14.25c and 17.30c; western; 14.85c and 19.05c; min. 96% Si and max. 2% Fe, eastern, bulk, c.l. 13.15c, 2000 lb to c.l. 14.65c; central, 13.85c and 16.90c; western, 14.45c and 18.65c, fob shipping point, freight allowed. Price per lb contained Si.

Silicomanganese, containing exactly 2 lb Mn and about ⅓ lb Si eastern zone, bulk, c.l. 6.15c, ton lots 7.05c; central zone, add 0.25c for c.l. and 0.60c for ton lots; western, add 0.80c for c.l. and 2.50c for ton lots. Notched, up 0.25c.

Ferrosilicon: Weighing about 5 lb and containing exactly 2 lb Si, packed, eastern zone, c.l. 4.20c, ton lots 4.60c, less than ton lots 5c; weighing about 2½ lb and containing 1 lb Si, packed, eastern zone, c.l. 4.35c, ton lots 4.75c, less 5.15c; notched 0.25c higher; central zone, add 0.25c for c.l. and 0.60c for smaller lots; western zone, add 0.45c rate allowed for c.l. and 0.90c for smaller lots. Prices are fob shipping point, freight allowed; spot prices 0.25c higher. Deduct 0.50c for bulk carlots.

Manganese Metal: (Min. 96% Mn, max. 2% Fe), per lb of metal, eastern zone, bulk, c.l. 30c, 2000 lb to c.l., 32.00c; central 31.00c and 33.45c; western, 31.45c and 34.40c.

Electrolytic Manganese: 99.9% plus, fob Knoxville, Tenn., freight allowed east of Mississippi on 250 lb or more: Carlots 32c, ton lots 34c, drum lots 36c, less than drum lot 38c. Add 1½c for hydrogen-removed metal.

Manganese-Boron: (Mn 75% approx., B 15-20%, Fe 5% max., Si 1.50% max. and C 3% max.) Prices per lb of alloy. Contract, ton lots $1.89, less $2.01, eastern, freight allowed; $1.903 and $2.023, central; $1.935 and $2.055, western; spot up 5c.

Nickel-Boron: (B 15-18%, Al 1% max., Si 1.50% max., C 0.50% max., Fe 3% max., Ni, balance). Prices per lb of alloy. Contract, 5 tons or more $1.90, 1 ton to 8 tons $2.00, less than ton $2.10, eastern, freight allowed; $1.9125, $2.0125 and $2.1125, central; $1.9445, $2.0445 and $2.1445, western; spot same as contract.

Borosil: 3 to 4% B, 40 to 45% Si; $6.25 per lb contained B, fob Philo, O., freight not exceeding St. Louis

Bortam: B 1.5-1.9%, ton lots, 45c per lb; less-ton lots, 50c per lb.

Carbortam: B 0.90 to 1.15% net ton to carload, 8c per lb, fob Suspension Bridge, N. Y., freight allowed same as high-carbon ferrotitanium.

Silicaz Alloy: (Si 35-40%, Ca 9-11%, Al 5-7%, Zr 5-7%, Ti 9-11% and B 0.55-0.75%) Prices per lb of alloy, contract, or spot carlots 35.00c, ton lots 37.00c, less 39.00c, eastern, freight allowed; 35.30c, 38.10c and 40.10c, central; 35.30c, 40.05c and 42.05c, western; spot up 0.25c.

SMZ Alloy: (Si 60-65%, Mn 5-7%, Zr 5-7% and Fe approx. 20%) Prices per lb of alloy, contract, carlots 12.50c, ton lots 13.25c, less 14.00c, eastern zone, freight allowed; 12.80c, 14.35c and 15.10c, central; 12.80c, 16.30c and 17.05c, western; spot up 0.25c.

CMSZ Alloy 4: (Cr 45-49%, Mn 4-6%, Si 18-21%, Zr 1.25-1.75% and C 3.00-4.50%). Contract or spot, carlots, bulk 12.00c, packed 12.75c; ton lots 13.50c, less 14.25c, eastern zone, freight allowed; 12.30c, 13.05c, 14.60c, 15.35c, central; 12.30c, 13.05c, 16.65c, 17.30c, western.

CMSZ Alloy 5: (Cr 50-56%, Mn 4-6%, Si 13.50-16.00%, Zr 0.75-1.25%, C 3.50-5.00%) Prices per lb of alloy, contract or spot, carlots, bulk 11.75c, packed 12.50c, ton lots 13.25c, less 14.00c, eastern, freight allowed; 12.05c, 12.80c, 16.3 17.05c, western.

Zirconium Alloy: 12-15%, per of alloy, eastern, contract, carl bulk 4.85c, packed 5.30c, ton 5.65c, less 6.00c; spot up 0.25c.

Zirconium Alloy: Zr 35-40%, east contract basis, carloads in bulk package, per lb of alloy 14.50c, lots 15.75c, less 17.00c; spot 0.25c.

Alsifer: (Approx. 20% Al, 40% 40% Fe) Contract basis fob Niag Falls, N. Y., lump per lb 6.25c; lots 6.75c; less 7.25c. Spot up

Simanal: (Approx. 20% each Si, Al) Packed, lump, carload 9c, lots 9.25c, less-ton lots 9.75c per alloy; freight not exceeding Louis rate allowed.

Tungsten Metal Powder: Spot, less than 97%, $2.50-$2.60; fre allowed as far west as St. Louis

Grainal: Vanadium Grainal No. 87.5c; No. 6, 60c; No. 79, 45c; fob Bridgeville, Pa., usual fre allowance.

Vanadium Pentoxide, technic grade: Fused, approx. 89-92% V and 5.84% NA_2O; or air dried, 85% V_2O_5 and 5.15% NA_2O, $ per lb contained V_2O_5 fob p freight allowed on quantities of lb and over to St. Louis.

OPEN MARKET PRICES, IRON AND STEEL SCRAP

Prices are dollars per gross ton, including broker's commission, delivered at consumer's plant except where noted.

OPEN HEARTH AND BLAST FURNACE GRADES

	—Heavy Melting— No. 1	—Heavy Melting— No. 2	No. 1 Busheling	—Bundles— No. 1	—Bundles— No. 2	—Bundles— No. 3	Machine Shop Turnings	Mixed Borings, Turnings	Short Shovel Turnings	Cast Bori
Pittsburgh	32.50	32.50	32.50	32.50	32.50	32.50	26.00–26.50	26.00–26.50	28.00–28.50	27.00–27
Philadelphia	30.50–31.50	30.50–31.50	30.50–31.50	30.50–31.50	30.50–31.50	28.50–29.00	23.50–24.00	23.50–24.00	23.50–24.00	23.50–24
Chicago	30.00	30.00	30.00	30.00	30.00	28.00	25.00	25.00	28.25	26
Cleveland	30.00–32.50	30.00–32.50	30.00–32.50	30.00–32.50	30.00–32.50	28.00–30.50	24.00–24.50		25.00–25.50	25.00–25
Cincinnati	29.00	29.00	28.00	29.00	29.00		22.50	21.00	24.00	22
•Boston	25.00–26.00	25.00–26.00	25.00–26.00	25.00–26.00	25.00–26.00	23.00–24.00	19.00–20.50	17.35–17.85	21.00–22.50	17
‡New York	26.50–27.00	26.50–27.00	26.50–27.00	26.50–27.00	26.50–27.00	24.50–25.00	20.50	20.50	22.50	
Buffalo	32.00–33.00	29.00	29.00	29.00	29.00	27.00	19.50	19.50	22.00	20
‡Detroit	27.00–27.50		27.00–27.50	27.00–27.50	27.00–27.50	25.00–25.50	20.00–20.50	20.00–20.50	22.00–22.50	22.00–22
Valley	32.50	32.50		32.50			26.50–27.00		27.50–28.00	27.50–28
Mansfield							26.00		28.00	
St. Louis	22.22	22.22					14.72		16.72	
Birmingham	22.00–22.50	22.00–22.50	22.00–22.50	22.00–22.50	22.00–22.50	20.00–20.50	14.50–15.00	14.50–15.00	16.50–17.00	15.50–16
San Francisco	19.50	19.50	19.50	19.50	19.50	10.00	8.00			
Seattle	19.00	19.00	19.00	19.00	19.00	17.00	11.50	11.50		
Los Angeles	16.50	15.50		14.50	14.50		8.00	8.00		

ELECTRIC FURNACE, FOUNDRY AND SPECIAL GRADES

	Bar Crops and Plate	Cast Steel	Punchings and Plate Scrap	Electric Furnace Bundles	Heavy Turnings	Alloy Free Turnings	Cut Structural and Plate Scrap 1 ft and under	Cut Structural and Plate Scrap 2 ft and under	No. 1 Chemical Borings	Tin
Pittsburgh	34.50–35.00	34.50–35.00	34.50–35.00	33.00–33.50	31.00–31.50	29.00–29.50	34.50–35.00	34.50–35.00	31.50–32.00	28.00–28
Philadelphia	34.00–34.50	34.00–34.50	34.00–34.50	34.00	32.50–33.00		35.00–36.00	35.00–36.00	31.00–31.50	
Chicago	26.25	26.25	26.25	24.75	23.25		26.25	25.75		
Cleveland	35.00	35.00	35.00	32.50	30.00–32.50	27.00	34.50	34.50	27.00	
•Boston	29.35	29.35–29.85	29.35–29.85	29.35	26.35	25.35	28.85	28.85	25.85	
‡New York			28.50–30.00	27.50–28.00			29.00–30.00	29.00–30.00	26.00	
Buffalo		27.00	30.00–31.00	28.50	22.50	23.00	28.50	28.50	22.75	
‡Detroit			28.50–30.50	30.50						
Birmingham	24.50–25.00	24.50–25.00	24.50–25.00				24.50–25.00	24.50–25.00		
San Francisco	18.00	18.00				8.00	20.50	20.00		
Seattle			21.50				21.50	21.50		

STEEL GRADES OF RAILROAD ORIGIN

	No. 1 Heavy Melting R.R. Steel	Railroad Malleable	Axles	Rails — Rerolling	Rails — Random Lengths	Rails — Cut 3-ft and under	Cut 18-in. and under	Railroad Specialties	Uncut Tires	Angl Splice
Pittsburgh	33.50	34.00	38.50	35.00	33.00	35.00	36.00	36.00–36.50	36.00	3
Chicago	31.00			34.50–35.00	38.00	39.00	40.00	36.00		3
Cincinnati	29.00	35.00		36.00	36.00		40.00			
Valley	32.50									
St. Louis		28.00	27.00	25.00	24.00	27.50			23.50	2
Birmingham	23.00–23.50			25.50–26.00	24.00–24.50	26.50–27.00	27.50–28.00			25.50–2
San Francisco			26.50		21.00				23.00	
Seattle	20.00	27.50			20.00					2

CAST IRON GRADES

	No. 1 Cupola Cast	Charging Box Cast	Heavy Breakable Cast	Stove Plate	Unstripped Motor Blocks	Malleable	Brake Shoes	Clean Auto Cast	No. 1 Wheels	Burnt
Pittsburgh	43.00–44.00	43.00–44.00	41.00–42.00	39.00–40.00	36.00–38.00	40.00–41.00	33.00–34.00	43.00–44.00	38.00–39.00	33.00–3
Philadelphia	43.00	42.00	41.50–42.00		38.50–40.00	45.00		43.00	42.00	
Chicago	40.00–45.00					40.00–45.00		35.00–40.00		
Cincinnati	40.00	30.00	32.00	28.00	30.00		28.00	40.00		
•Boston	42.00	36.00–38.00	35.00–37.00	36.00				38.00–40.00		
‡New York	37.00–38.00	37.00–38.00			34.50	37.00–38.00			38.00	32.75–33.25
Buffalo	35.00–40.00	31.00–35.00		33.00–38.00		34.00–38.00				
‡Detroit	35.00–37.00		28.00–30.00					35.00–37.00		
•St. Louis	25.00–30.00	25.22	22.75	27.00			20.25	32.00	26.00	2
Birmingham	30.00		25.00	28.00	25.00		22.75		27.00	
Seattle	27.50	22.50	21.50	25.50	21.50	27.50	27.50	27.50	24.00	
Los Angeles	30.00									

* For shipping point; ‡ fob t acks; ‡ dealers buying prices, fob shipping point; § nominal; ** fob dealers yard.

LOGEMANN Presses for Sheet Scrap

THE NATION NEEDS YOUR SHEET SCRAP!

In mills, industrial plants and scrap yards, LOGEMANN SCRAP PRESSES are working day and night to prepare sheet scrap for the furnaces.

Sheet mills particularly recognize the value of the years of experience and the performance records which back up LOGEMANN designs and workmanship.

The line includes scrap presses *designed for mill Service,* presses *designed for automobile plant conditions,* presses *designed for general plant applications.* Write for details.

The scrap press illustrated operates in one of the largest industrial plants. Compresses scrap from three directions to produce high-density mill size bundles. Built in various capacities.

LOGEMANN BROTHERS COMPANY
3126 W. Burleigh St. **Milwaukee, Wisconsin**

NONFERROUS METAL PRICES

Copper: Electrolytic, carlots 19.50c, del. Conn.; Lake, 19.62½c, del. Conn. Dealers may add ¾c for 5000 lb to carload; 1c, 1000-4999 lb; 1½c, 500-999 lb; 2c, 0-499 lb. Casting, 19.25c, refinery, 20,000 lb or more; 19.50c, less than 20,000 lb.

Brass Ingot: 85-5-5-5 (No. 115) 20.50c; 88-10-2 (No. 215) 24.75c; 80-10-10 (No. 305) 23.50c; No. 1 yellow (No. 405) 16.25c; carlot prices, including 25c per 100 lb freight allowance; add ¼c for less than 20 tons.

Zinc: Price western 10.50c, brass special 10.75c, intermediate 11.00c, E. St. Louis; high grade 11.50c, del., carlots. For 20,000 lb to carlots add 0.15c; 10,000-20,000 lb 0.25c; 2000-10,000 lb 0.4c; under 2000 lb 0.50c.

Lead: Common 12.80-12.85c, chemical 12.90c, corroding 12.90c, E. St. Louis for carlots.

Primary Aluminum: 99% plus, ingots 15.00c del., pigs 14.00c del.; metallurgical 94% min. 18.50c del. Base 10,000 lb and over; add ½c 2000-9999 lb; 1c less through 2000 lb.

Secondary Aluminum: Piston alloy (No. 122 (type) 17.00c; No. 12 foundry alloy (No. 2 grade) 16.50c; steel deoxidizing grades, notch bars, granulated or shot: Grade 1 (95-97½%) 17.00c; grade 2 (92-95%) 16.25c; grade 3 (90-92%) 15.75c; grade 4 (85-90%) 15.50c. Above prices for 30,000 lb or more; add ¼c 10,000-30,000 lb; ½c 5000-10,000 lb; ¾c 1000-5000 lb; 1¼c less than 1000 lb. Prices include freight at carload rate up to 75c per 100 lb.

Magnesium: Commercially pure (99.8%) standard ingots (4-notch, 17 lb) 20.50c per lb, carlots; 22.50c 100 lb to c.l. Extruded 12-in. sticks 34.00c-38.00c.

Tin: Prices ex-dock, New York in 5-ton lots. Add 1 cent for 2240-11,199 lb, 1½c 1000-2239, 2½c 500-999, 3c under 500. Grade A, 99.8% or higher (includes Straights), 70.00c; Grade B, 99.8% or higher, not meeting specifications for Grade A, with 0.05% max. arsenic, 69.87½c; Grade C, 99.65-99.79% incl. 69.62½c; Grade D, 99.50-99.64% incl., 69.50c; Grade E, 99-99.49% incl. 68.12½c. Grade F, below 99% (for tin content), 69.00c.

Antimony: American bulk carlots fob Laredo, Tex., 99.0% to 99.8% and 99.8% and over but not meeting specifications below, 28.25c; 99.8% and over (arsenic, 0.05% max.; other impurities, 0.1% max.) 28.75c. On producers' sales add ¼c for less than carload to 10,000 lb; ½c for 9999-224 lb; and 2c for 223 lb and less; on sales by dealers, distributors and jobbers add ½c, 1c, and 3c, respectively.

Nickel: Electrolytic cathodes, 99.9%, base sizes at refinery, unpacked 35c lb; 25 lb pigs produced from electrolytic cathodes 36.50c lb; shot produced from electrolytic cathodes 37.50c lb; "F" nickel shots or ingots for additions to cast iron 35.50c lb. Prices include import duty.

Mercury: Open market, spot, New York, $88-$92 per 76-lb flask.

Arsenic: Prime, white, 99%, carlots, 4.00c lb.

Beryllium-Copper: 3.75-4.25% Be, $14.75 per lb contained Be.

Cadmium: Bars, ingots, pencils, pigs, plates, rods, slabs, sticks, and all other "regular" straight or flat forms $1.50 lb, del.; anodes, balls, discs and all other special or patented shapes, $1.55.

Cobalt: 97-98%, $1.50 lb for 550 lb (keg); $1.52 lb for 100 lb (case); $1.57 lb under 100 lb.

Gold: U. S. Treasury, $35 per ounce.

Indium: 99.9%, $2.25 per troy ounce.

Silver: Open market, N. Y. 81.50c per ounce.

Platinum: $58-$61 per ounce.

Palladium: $24 per troy ounce.

Iridium: $110 per troy ounce.

Rolled, Drawn, Extruded Products

(Copper and brass product prices based on 19.50c, Conn., for copper. Freight prepaid on 100 lb or more.)

Sheet: Copper 30.93c; Yellow brass 27.53c; commercial bronze, 95% 31.07c, 90% 30.56c; red brass, 85% 29.53c, 80% 29.02c; best quality 28.44c; Everdur, Duronze, Herculoy or equiv., cold-drawn, 35.79c; nickel silver, 18%, 39.82c; phosphor bronze, grade A, 5%, 48.82c.

Rods: Copper, hot rolled 27.28c, cold drawn 28.28c; yellow brass, free cutting, 22.28c, not free cutting 27.22c; commercial bronze, 95% 30.76c, 90% 30.25c; red brass, 85% 29.22c, 80% 28.71c; best quality 28.13c.

Seamless Tubing: Copper 30.97c; yellow brass 30.28c; commercial bronze 90% 32.97c; red brass 85% 32.19c, 80% 31.68c; best quality brass 30.85c.

Copper Wire: Bare, soft, fob eastern mills, carlots 25.52c, less carlots 26.02c; weatherproof, fob eastern mills carlot 26.42c, less carlots 26.92c; magnet, delivered, carlots 28.93c, 15,000 lb or more 29.18c, less carlots 29.68c.

Aluminum Sheets and Circles: 2s and 3s flat mill finish, base 30,000 lb or more del.; sheet widths as indicated; circle diameter 9" and larger:

Gage	Width	Sheets	Circles
.249"-7	12"-48"	22.70c	25.20c
8-10	12"-48"	23.20c	25.70c
11-12	26"-48"	24.20c	27.00c
13-14	26"-48"	25.20c	28.50c
15-16	26"-48"	26.40c	30.40c
17-18	26"-48"	27.90c	32.90c
19-20	24"-42"	29.80c	35.30c
21-22	24"-42"	31.70c	37.20c
23-24	3"-24"	25.60c	29.20c

Lead Products: Prices to jobbers: Full sheets 16.25c, 140 sq ft rolls; add per hundredweight, 25c, 80 to 140 sq ft; 50c, 20 to 80 sq ft; 75c, 10 to 20 sq ft.
Pipe: Full coils 15.50c; cut coils 15.75c.
Lead Traps and Bends: List plus 38%.

Zinc Products: Sheet, 15.50c-15.75c, fob mill, 36,000 lb and over. Ribbon zinc in coils, 14.50c-14.75c, fob mill, 36,000 lb and over.

PLATING MATERIALS

Chromic Acid: 99.75%, flake, del., carloads 16.25c; 5 tons and over 16.75c; 1-5 tons 17.25c; 400 lb to 1 ton 17.75c; under 400 lb 18.25c.

Copper Anodes: In 500-lb lots, fob shipping point, freight allowed, cast oval over 15 in., 36.87½c; flat untrimmed, 36.87½c; electro-deposited, 30.62½c.

Copper Carbonate: 52-54% metallic Cu, 250 lb barrels nom.

Copper Cyanide: 70-71% Cu, 100-lb kegs or bbls. nom., fob, Niagara Falls.

Sodium Cyanide: 96%, 200-lb drums 15.00c; 10,000-lb lots 13.00c fob Niagara Falls.

Nickel Anodes: 500-2999 lb lots; cast and rolled carbonized 51.00c; rolled depolarized 52.00c.

Nickel Chloride: 100-lb kegs or 275-lb bbls 18.00c lb, del.

Tin Anodes: 1000 lb and over nom. del.; 500-999 nom.; 200-499 nom.; 100-199 nom.

Tin Crystals: 400 lb bbls nom., fob Graselli, N. J.; 100-lb kegs nom.

Sodium Stannate: 100 or 300-lb drums nom. del.; ton lots nom.

Zinc Cyanide: 100-lb kegs or bbls 33.00c fob Niagara Falls.

SCRAP METALS

BRASS MILL ALLOWANCES

Prices for less than 15,000 lb fob shipping point. Add ¾c for 15,000-40,000 lb; 1c for 40,000 or more.

	Clean Heavy	Rod Ends	Clean Turnings
Copper	17.125	17.125	16.375
Yellow brass	13.750	13.250	12.875
Commercial Bronze			
95%	15.875	15.625	15.125
90%	15.750	15.500	15.000
Red brass			
85%	15.500	15.250	14.750
80%	15.375	15.125	14.625
Best Quality (71-79%)	14.625	14.375	.....
Muntz metal	12.875	12.625	12.125
Nickel silver, 5%	14.500	14.250	7.250
Phos. bronze, A, B	18.125	17.875	16.875
Naval brass	13.250	13.000	12.500
Manganese bronze	13.250	13.000	12.375

BRASS INGOT MAKERS' BUYING PRICES

(Cents per pound, fob shipping point, carload lots)

No. 1 copper 17.00, No. 2 copper 16.00, light copper 15.00, composition red brass 16.00, auto radiators 13.00, heavy yellow brass 11.50, brass pipe 12.00.

REFINERS' BUYING PRICES

(Cents per pound, delivered refinery, carload lots)

No. 1 copper, 17.25-17.50c; No. 2 copper 16.25c; light copper 15.00-15.25c; refinery brass (60% copper), per dry copper content, 14.87½-15.25c.

DEALERS' BUYING PRICES

(Cents per pound, New York, in ton lots or more)

Copper and Brass: Heavy copper and wire, No. 1 15.50-16.00; No. 2 14.50-15.00; light copper 13.50-14.00, No. 1 composition red brass 14.00-14.50, No. 1 composition turnings 13.00-13.50, mixed brass turnings 9.50-10.00, new brass clippings 13.00-13.50, No. 1 brass rod turnings 11.75-12.25, light brass 8.00-8.50, heavy yellow brass 10.00-10 50, new brass rod ends 12.00-12.50, auto radiators, unsweated, 11.00-11.50, clean red car boxes 12.50-13.00, cocks and faucets 11.75-12.00, brass pipe 11.50-11.75.

Lead: Heavy lead 11.25-11.50, battery plates 6.50-6.75, linotype and stereotype 13.50-14.00, electrotype 11.50-12.00, mixed babbitt 12.00-12.50, solder joints 13.50-14.00.

Zinc: Old zinc 5.50-6.00, new die cast scrap 5.50-6.00, old die cast scrap 4.00-4.50.

Tin: No. 1 pewter 44.00-45.00, block tin pipe 60.00-62.00, auto babbitt 35.00-36.00, No. 1 babbitt 35.00-38.00, siphon tops 38.00-40.00.

Aluminum: Clippings, 2S, 10.00-10.25, old sheets 7.50-7.75, crankcases 7.50-8.00, turnings 4.00-4.25, pistons, free of struts, 6.75-7.00.

Nickel: Anodes 19.50-20.50, turnings 16.50-17.50, rod ends 19.00-20.00.

Monel: Clippings 14.00-15.00, turnings 9.00, old sheet 12.00-13.00, rods 12.50-13.00, castings 10.00.

You're Cooking on Both Front Burners

(PRODUCTION AND SALES, TOO)

...when you use AMERICAN PHILLIPS SCREWS

IN PRODUCTION: Many top-rank stove builders and other makers of household appliances rate the modern method of American Phillips Screw-driving as a major means of cost-control. For American Phillips Screws save by making power-driving practical on *all* jobs. And they save in many other ways: Fumble-proof starts, automatically straight driving, no burred screwheads or spoiled work, faster assembly . . . and more finished goods on the shipping platform *every day. Sum of all time-savings runs as high as 50%.*

IN SALES PROMOTION: American Phillips Screws give *any* product a smartly finished, modern look that packs plenty of appeal to purchasers. And there are no snags to catch hose or clothes. So American Phillips Screws pay off double...in the plant and on the sales-floor. Ask American to show you how and why *American Phillips Screws always cost least to use.*

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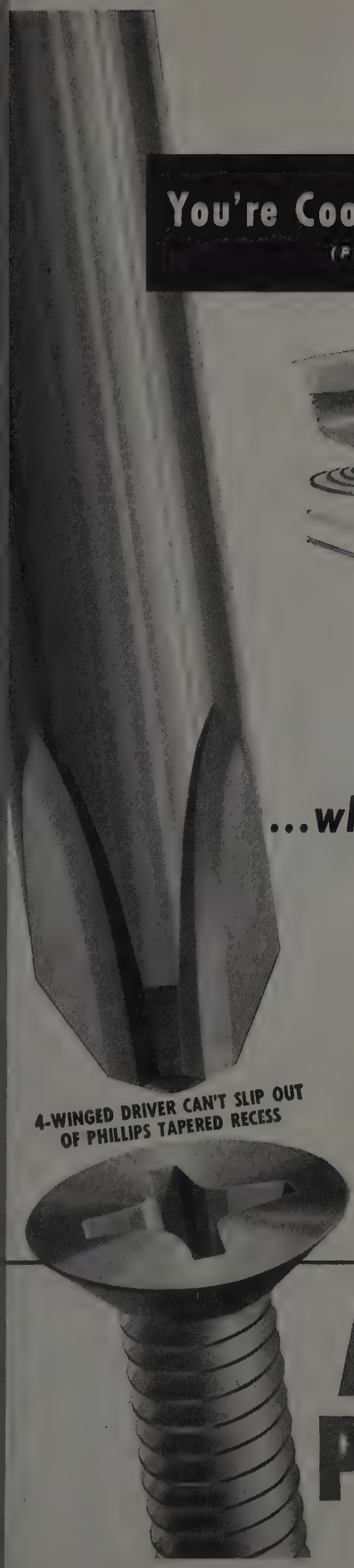

AMERICAN PHILLIPS *Screws*

ALL TYPES

ALL METALS: Steel, Brass, Bronze, Stainless Steel, Aluminum, Monel, Everdur (silicon bronze)

Steel Plates . . .

Backlog of Orders Extends To Third and Fourth Quarters Despite Costs

Plate Prices, Page 127

New York — Reflecting the sold-up condition of plate mills, tank fabricators are unable to get operations up much above 75 per cent of capacity. All have substantial backlogs, in some instances enough to provide them with almost a year's normal operation.

More recently tank fabricators assert there has been some falling off in demand, and ascribe this particularly to extended delivery promises. However, there is plenty of business available, and at premiums, where fairly prompt delivery can be offered. Some shops apparently are in position to take some of this premium business, but they are the exception.

In addition to extended delivery promises, the question of financing is also having a curbing effect on demand from municipalities, which a while back had anticipated more federal help than has been forthcoming. This, combined with the sharp increase in labor and material costs since appropriations were first considered, is causing various projects to fall by the wayside. On the other hand, there are some serious needs and much of this work is going ahead regardless of cost. All in all, there is less municipal work than in the immediate prewar years, however. This is also true of industrial demand, at least for the time being. Export inquiry has eased due primarily to extended deliveries.

Commenting on recent plate price advances, some tank makers assert that on the items they require steel costs have increased about $10 a ton, due particularly to the changes in extras.

On the basis of the present outlook plate mills see capacity operations ahead until well into the third quarter. Certain mills are quoting such deliveries now. Those selling on a quarterly basis are confident they will be able to quickly fill up their second quarter capacity the moment they open their books for that position. This action should come around the end of this month. Light gage plates continue in particularly heavy demand.

Seattle—Plate inventories are low and receipts of materials are below normal requirements. Shops report a good average of small jobs and operations are near capacity

Philadelphia—While some plate producers are selling on a quarterly basis and are expected to set up schedules for the next three-month period shortly, still others have long been following the practice of entering orders well ahead. As a result, there are certain producers who are now booked through the third quarter and are actually taking some business, although on a highly selective basis, for the last period of the year. In practically all instances mills are well behind on their commitments, due primarily to labor disruptions and to shortage of pig iron. One district mill, which recently was down ten days because of lack of pig iron, is still unable to get production up to much more than 60 per cent.

Boston — Plate fabricators are paying several prices for New England delivery, depending on basing point and base quotation, although more tonnage is being based Sparrow Point. Tonnage is still too limited for an economic adjustment through competition. Most plate shops are in need of material as several mills lost more tonnage in the fourth quarter than had been estimated. Extras for killed steel are more in evidence. In heavier sizes, mill practice generally requires this and larger gages or substantial tonnage required for weldments are most affected, an advance averaging $10 a ton for the extra. Light tank plates are scarce. Railroad car building requirements are also an increasing burden on plate mills. Most active shipyards are on reconversion and repair work, taking a minimum plate tonnage.

Birmingham—Plate production in the South has increased to virtual capacity. Some variation of the plate schedule is evident from time to time as gaps are filled in on other specifications, but the overall production is being steadily crowded by demand which remains exceptionally high.

Washington, Pa.—Jessop Steel Co. has established the following prices, including annealing and pickling, for 20 per cent stainless clad steel plates: Type 304, 24.00c; 410, 22.00c; 430, 22.50c; 446, 29.00c.

Steel Bars . . .

Bar Prices, Page 126

New York—As the time approaches when a number of leading sellers will begin making up schedules for second quarter, bar consumers are showing a livelier interest. There is not only inquiry as to precisely when the mills will begin setting up quotas for second quarter, but question as to how much tonnage they may likely be given. As indicated, actual requirements are still running heavier than the mills were able to meet, and while there is some talk that supply and demand on carbon bars may be brought into fair balance before the end of the second quarter, there are some who take the position that that remains to be seen. Certainly in the lighter sizes actual requirements remain heavy.

Boston—A substantial part of the carbon bar requirements in this territory take the special and killed quality extras, notably stock for forging, carburizing, machining and other processing. Although the carbon is frequently the determining factor as to killed, higher extras apply on most rounds, flats, squares and other shapes, also larger sizes in the lower-carbon grades. Application of bar extras is most confusing among warehouses. Demand is heavily centered in small sizes. Pressure for automobile forgings has eased in spots and there are some deferments. Forge shops, however, are pressing for bar stock shipments and most of them are submitting tentative requirements for second quarter. Inventories of larger carbon sizes and alloys are in reasonable balance with most consumers and distributors.

Seattle—Merchant bar mills are operating steadily and are rapidly reducing order backlogs. New business is confined to regular and emergency projects. Demand continues heavy, warehouses reporting this item extremely hard to get.

Sheets, Strip . . .

New Price Schedules Working Out; A Few Extras Still to Be Clarified

Sheet & Strip Prices, Page 126

New York—While new price schedules are becoming fairly well worked out, some producers have not as yet taken any action on narrow strip or on silicon sheets. In fact, no action has been taken on silicon sheets in any quarter, so far as can be learned, although such a move is in prospect and especially with regard to the light silicon sheets, which sellers declare have been greatly underpriced for a long time, as reflected in the scarcity of this material. Also, certain producers have not as yet officially brought out new schedules on stainless sheets, although indications are that they will meet prices recently announced by one large producer.

Most sellers of major grades of sheets have not opened their books for second quarter, but are expected to most any time, possibly around Feb. 1. By the beginning of next quarter, some mills believe they will be fairly well caught up on their commitments, as they have been making every effort to keep their new promises for the current quarter in check. Some sellers estimate they may have arrearages of a week or so when the new period rolls around, but to at least two or three that would seem reasonably in balance, inasmuch as they were behind at least two months on their commitments when the current quarter began.

Washington, Pa.—Jessop Steel Co. has established the following prices, including annealing and pickling, for 20 per cent stainless clad steel sheets: Type 304, 22.00c; 410, 20.00c; 430, 20.50c; and 446, 27.00c.

Cincinnati—Although sheet mills, under new pricing policies, may tend to concentrate allotments within normal sales territory, there is evidence that much tonnage will go on longer hauls. This is especially true in specialties. No slackening in demand is noted. In fact, the tight first quarter situation which developed on priorities and reflected in carryover, has brought a stream of inquiries concerning second quarter prospects, but schedules are not yet being built that far ahead. Prices are steady even if changes did cause confusion.

Boston — Narrow cold-rolled strip extras are yet to be clarified in some quarters. Hot-strip deliveries are out of balance and cold reducers are unable to maintain fixed production schedules. Production is frequently reshuffled and geared to hot stock on hand which in turn tends to upset delivery promises. There is no easing of pressure for steel from consumers, although in numerous cases the extent of higher material costs this quarter are far from established. Some producers are not taking additional volume for shipment this quarter while others have yet to schedule for March. Scattered mills which are absorbing relatively high freight rates in this area are more selective in acceptance of orders and one Ohio producer is reported to be gradually withdrawing, except on higher priced specialties. Fairly large quantities of hot-rolled sheets on a monthly basis are offered at premium prices, some fob Detroit.

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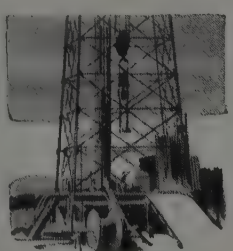

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Wire . . .

Wire Prices, Page 127

Pittsburgh—A new price base of $4.50 per 100 pounds for galvanized, standard and cement coated nails and staples was established by Pittsburgh Steel Co. last week, with revisions in applicable extras. Portsmouth Steel Corp.'s price base for standard and cement coated nails is $4.20. These prices represent a spread over leading producers' price base of $15 and $9 a ton, respectively. There has been little resistance to recent upward revision in prices for manufacturers and merchant wire items to date, and on basis of present demand and order backlogs little opposition is indicated except in so far as to revise specifications to avoid this or that extra.

Boston—Consumers of bessemer screw stock have switched to resulphurized basic in some instances, being unable to secure usual grades of bessemer. Although somewhat higher in sulphur, this is free cutting and generally meets requirements. For some time rod supply promises to plague wire drawers. Most mills, drawing more from their own supply of semifinished, are restricting quotas and a few have practically withdrawn from the Worcester base. Wire inventories with consumers are generally low and pressure for delivery is intense. Screw manufacturers are in this category. Those usually drawing most of their own wire are taking mill-drawn stocks.

Tin Plate . . .

Tin Plate Prices, Page 127

Pittsburgh—Establishment of a Warren, O., basing point on black plate, hot-dip and electrolytic tin plate by Republic Steel Corp. at Pittsburgh price base level means that mills at Pittsburgh, Wheeling and Weirton will have to absorb considerable freight equalization on shipments to Canada, upper New York state and New England.

Chicago — Tin plate producers' schedules for February are completely filled and any unspecified tonnage from first quarter allotments will have to be produced in March. Consumers still must certify that material covered in their orders of tin and terne plate will be used in accordance with order M-43. Box car shortage is rearing its head again, and from time to time it is necessary to pile production while cars are awaited.

Reinforcing Bars . . .

Reinforcing Bar Prices, Page 127

Seattle—Many large projects involving reinforcing bars are on drawing boards or up for bids but unexpectedly high costs are delaying placements. Mills have many firm offers and anticipate major contracts but current factors are retarding completion of deals.

St. Louis—Reinforcing bar producers are about current on orders due to lighter demand. Other bottlenecks in the building materials field are causing postponement of considerable commercial construction and improvements in public utility facilities. A cutback in GI housing work also is slowing concrete bar demand. Barmakers are having trouble obtaining old rails in quantity for that purpose, since railroads' inability to get new steel is curbing the scrap they put on the market. That scarcity began in September and mills have been refusing new bar orders, which has allowed them to catch up. For the limited orders being accepted now, delivery is promised in March.

Structural Shapes . . .

Structural Shape Prices, Page 127

New York—While structural awards recently have been light, inquiry continues to accumulate, with still further projects pending. One of the larger of these latter projects is a truck terminal in lower Manhattan for the New York Port Authority. Recent inquiry includes School No. 137, requiring approximately 1100 tons, in Queens, and an addition to School No. 92 in Brooklyn.

Meanwhile, most fabricators are making inroads on their backlogs, although they still have considerable work ahead. Most shape mills are comfortably situated, although their delivery promises are easier, especially now that they have been able to maintain production at a fairly good rate for the past several weeks. There are, however, certain exceptions. One eastern mill, for instance, has been unable to maintain much more than a 50 per cent rate of production this month. Export demand for shapes is strong where early shipping promises can be had; there is less interest in the more extended offerings.

Chicago — Awards and inquiry for fabricated structural steel emanating from this territory are surprisingly light, considering the volume of planned construction. Lack of new business, however, is not disturbing fabricators for their main concern now is to get delivery of shapes from mills to take care of work already in progress. Higher prices for steel will discourage some construction, it is believed, a matter which may become important later in the year. There is still much confusion over the newly imposed extras. Offhand guesses are that the net increase will average close to $6 to $7 per ton.

Boston — Bulk of structural contracts placed are for work outside, including 4500 tons for power plants by one contractor. District shops generally are well filled with small tonnage volume on which estimates usually are based on warehouse quotations. Advance in plain material and other costs probably will increase original estimates on much tonnage now under contract, but not fabricated, by 10 to 15 per cent under escalator clauses. Among public work, the East Boston elevated highway tunnel extension with several spurs is expected to come out for bids this spring, taking close to 12,000 tons.

Philadelphia — Notwithstanding increasing inquiry in some districts, new demand for structural steel in the Philadelphia area continues to lag badly. One of the few larger inquiries involves 800 tons for the diesel engine shop of the Pennsylvania railroad at Harrisburg, Pa., previously noted as involving 400 tons. However, substantial work is in sight for later on. A leading award involves 550 tons for Pennsylvania railroad bridge at Roslyn, Pa., placed with Bethlehem Steel Co., Bethlehem, Pa.

Seattle — Fabricators are receiving some materials by both rail and water but allocations are below requirements. Consequently only small jobs are being accepted.

Semifinished Steel . . .

Semifinished Prices, Page 126

Pittsburgh—Extreme tight supply situation in finished steel supply has forced General Electric, Westinghouse, Packard, Nash, and other metalworking companies to purchase rerolling quality carbon steel ingots and other semifinished steel items at high prices, to be converted at other plants in some instances. A number of rerolling carbon steel ingot transactions have been made on the basis of conversion cost plus value of scrap charged, with some buyers forced to furnish the scrap. Some of these rerolling carbon steel ingots have been sold as electric furnace melted carbon ingots.

In its recent semifinished steel price announcement to the trade, Carnegie-Illinois Steel Corp. did not establish a set price for rerolling quality carbon steel ingots. The industry apparently is conducting price negotiation with each customer for this product. Carnegie did establish a price of $40 per gross ton for forging quality carbon ingots, however, which were sold previously at $8 above rerolling quality ingots.

Portsmouth Steel Corp. has announced a wire rod price base of $2.80 per 100 pounds.

Tubular Goods . . .

Tubular Goods Prices, Page 127

Pittsburgh—Upward price revisions on commercial quality seamless mechanical alloy steel tubing, announced by Timken Roller Bearing Co., Canton, O., on shipments as of Jan. 14, reflect the actual increased costs of alloy steel bar including extra revisions for size, cutting, marking, etc., less piercing loss. Electric furnace grade alloy mechanical tubing prices are 7½ per cent above new open hearth prices. It is impossible to arrive at an average price advance for numerous alloy tubing items, for prices vary widely from one analysis to another. The new prices are figured on old price base in effect prior to 9.5 per cent increase granted under OPA.

Some producers have established new quantity extras to jobbers on cold drawn seamless mechanical carbon tubing as follows: 600 feet or more is now 50 per cent, compared with 40; 300 to 599 feet, 80 against 65; 150 to 299 feet, 120 against 95; 75 to 149 feet, 195 against 145; and less than 75 feet, 250 against 200. Cutting extras for dead lengths are 10 per cent for lengths 1 inches to 10 feet; 20 to 24 feet, 15 per cent.

First large barge shipment of steel pipe (involving 9000 tons) to southwest by inland rivers since the end of the war was recently handled by Union Barge Line Corp. for consignment to Corpus Christi, Tex.

Boston — Most pipe producers have little direct shipment tonnage available for the balance of this year, but will cover distributors at about the base period, 1939-40, level. Inventories with the latter are kept down by heavy demand. So short of carbon pipe are some shop fabricators, higher priced substitutes are ordered, including carbon-moly and carbon-pressure tubing in pipe sizes. Users of other tubular products also are improvising specifications centering on grades most available.

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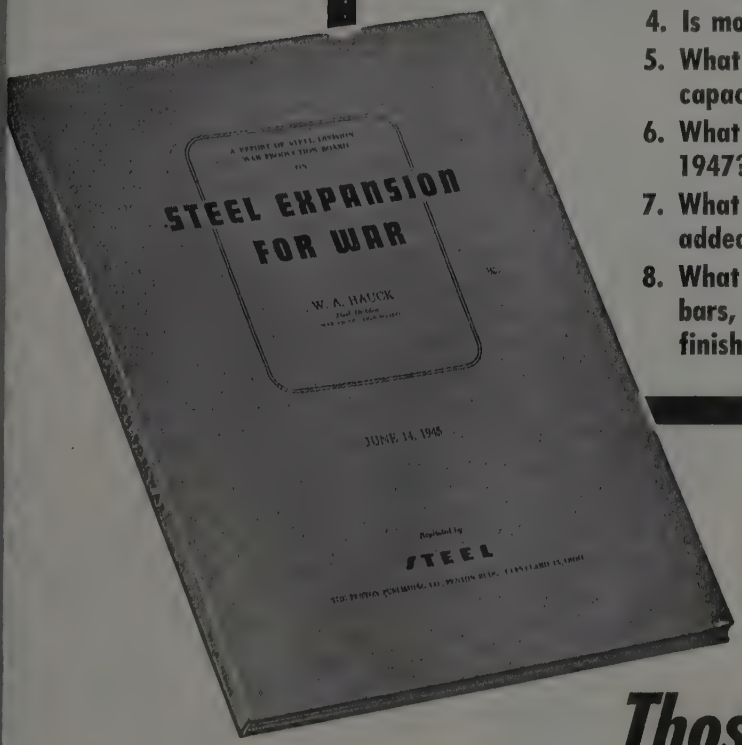
6. What will sheet and strip capacity be in 1947?
7. What new finishing capacity has been added since the war?
8. What companies make the sheets, strip, bars, plates, shapes, pipe, wire and other finished products you need today?



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Considerable utility tonnage remains to be placed for this year.

St. Louis—Pressure for pipe continues unabated, especially for sizes ⅜ to 1 inch, inclusive, in black and galvanized. But all sizes ⅜ to 3 inches are extremely scarce and are being shipped only to hardship cases. Mills do not expect to become current for three or four months. Orders taken now are for the third quarter. A shortage of railroad cars threatens a further setback to deliveries. Demand for buttweld pipe is about evenly divided between factory and residential projects.

Canton, O. —Steel & Tube Division, Timken Roller Bearing Co., has issued a revised schedule of prices for seamless mechanical alloy tubing in commercial quality, effective on shipments as of Jan. 14.

Metallurgical Coke . . .

Coke By-Product Prices, Page 127

Pittsburgh — Prices for Connellsville beehive furnace coke have been advanced slightly on a representative tonnage, with current prices now within a range of $8.75 to $9 per net ton. Operators of hand-drawn ovens using trucked coal are getting about a 60-cents per ton premium, making their price range $9.35 to $9.60 for Connellsville furnace coke.

Bulk of Connellsville beehive foundry coke is being sold within the range of $9.75 to $10.50 per net ton, an increase of 25 cents on the lower side of the price range.

Babcock Coal & Coke Co., Pittsburgh, has advanced New River beehive foundry coke to $11.75 per ton, compared with former price range of $10.25 to $10.50.

Pig Iron . . .

Shortage of foundry and basic grades continue acute in most districts

Pig Iron Prices, Page 129

New York—Foundries generally are having difficulty obtaining an adequate supply of pig iron. Relatively few are doing rated work which would give them priorities and as a result their output is far below normal. They are using an extraordinarily large proportion of scrap, as much as 90 per cent scrap in some instances, but even scrap is difficult to get and consequently operations are lagging. This situation prevails at a time when iron foundries, in particular, have more work in sight than in years; in fact, some have more business than at any time in their history.

A stringent situation is expected to continue for some time to come. Meanwhile, furnaces supplying this district are quoting on an fob basis, with delivered prices covering a wide range.

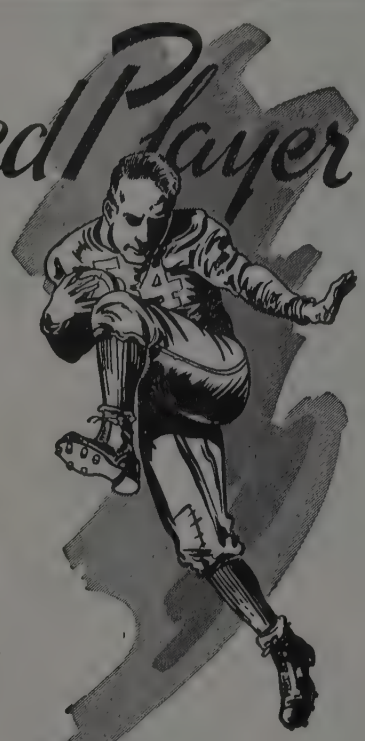
Philadelphia — District foundry iron consumers, not benefited by ratings, are experiencing one of their most difficult months in obtaining shipments. While certain furnaces which were down a few weeks ago are again operating, they either are not operating on foundry iron or are producing an excessive amount of rated tonnage in an effort to get caught up on commitments due when they were down. Next month may show some relief in this regard, although this may not be known for sure until some time this week.

Steel production for the district is showing a further slight gain, although certain mills are still badly handicapped by lack of basic iron. Were it not for a somewhat freer supply of scrap, they would not be able to maintain even their present rate of operations. It is to be emphasized, however, that scrap is still none too free, with very little being accumulated in the way of stocks, and that in the case of cast supply is extremely tight with prices becoming more and more out of line.

With prospects for a continued stringency in iron for some time to come there has been speculation as to the possibility of some foreign offerings. For instance, some Mexican iron was imported some months ago and was sold as far north as New England and at a delivered price in that district of around $62 a ton. More recently, some Finnish iron was being offered in New York at $72, port. However, these tonnages were relatively small, and there has been nothing further, except for some Swedish charcoal iron which is now being offered in the East at around $98, port. So far as can be learned, no sales have been made. On the other hand, many foreign consumers, especially in South America, would like to buy iron in this country, were it available.

Baltimore — While southern foundry

A Seasoned Player



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iron is scarce, the market here is $33.28, delivered. With Sparrow Point no longer a basing point the price is predicated on a $31.50, fob Steelton, Pa., price, plus the new freight rate of $2.16, minus the usual differential between northern and southern iron of 38 cents.

Chicago—Shipments of pig iron from furnaces have made a notable increase within the past few days. However, sellers are harassed by foundries as to when they will get some iron. Melting operations are geared to receipts of iron, with inventories nonexistent, with result that operations are unstable. Many foundries are working either reduced hours or shortened weeks. With all available merchant pig iron capacity in the district now fully engaged, ensuing weeks should see more foundry activity. Coke supply is adequate, but scrap and iron are short.

Buffalo—Raw material shortages continue to haunt foundries with many leading consumers curtailed to a three-day week. The prolonged shutdown of two furnaces by the leading merchant iron producer in the area is a serious blow to foundries, both here and on the seaboard. In some instances, melters have stepped up the use of silvery iron with cast scrap. However, foundry scrap grades are none too plentiful and brisk bidding has brought about some out-of-range price deals. The situation soon may ease somewhat as the merchant producer blows-in one of the two idle stacks.

Boston — Shortage of basic pig iron is curtailing steelmaking in some quarters. Steel works here depend on outside furnaces and shipments from these sources are down. Under the premium price program applying to the Mystic Iron Works, only foundry grades are included and basic melters get no relief. Better supply of free iron for foundries is developing with the Everett furnace shifting to a temporary malleable run to meet requirements in that grade. Some foundry and malleable will probably be produced alternately until the situation is eased. The district furnace also will meet rated tonnage deliveries this month. Incidentally, while consumers have lacked iron, those in this area are now paying lower prices for this raw material than others for they are paying the former Everett base prices which have not been advanced under the premium production plan.

Warehouse . . .

Warehouse Prices, Page 128

Pittsburgh — Steel distributors have established a price base on shapes of $4.05 per 100 pounds for city delivery and $3.95 for country; plain plates $4.30 and $4.20; floor plates $5.55 and $5.45. No prices yet have been announced on alloys, stainless or cold-rolled strip.

Warehouse interests have adopted the mill size extras on structural shapes, but quality and size extras on plates have been increased more than the mill increase. For locomotive fire box plate, the extra is 75 cents, against 50 cents at mill level; ordinary fire box 75 against 45; and flange steel 50 against 35. Size extra for 3/16-in. floor plates is 30 cents; ¼ and 5/16-in., 15 cents. No pattern yet has been established for size extras on lighter gages; distributors temporarily using old basis.

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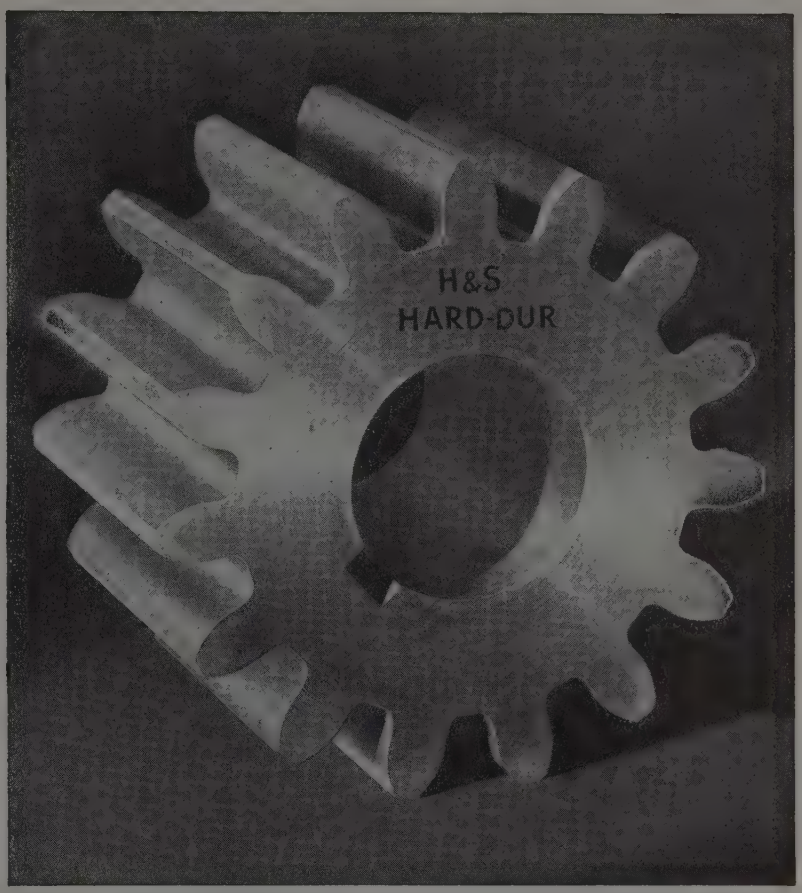

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price advances, demand for warehouse steel products increased substantially in recent weeks. One interest reports that shipments during first week of January were the second largest on record. Distributors' inventories continue unbalanced and well below normal despite moderate improvement in mill shipments lately.

Scrap . . .

Scrap Prices, Page 130

Philadelphia — Demand for cast scrap has forced prices on the principal grades still higher. Cupola cast is now selling at $3, delivered, although some small lots have been sold at still higher levels; charging box cast, $42; heavy breakable, $41.50 to $42; unstripped motor blocks, $38.50 to $40; malleable, $45; clean auto cast, $43; and No. 1 wheels, $42. More cast scrap is coming out than several weeks ago, but demand is more urgent, due to the extreme shortage of pig iron. Malleable also is especially tight.

Supply of melting steel has improved with industrial scrap coming out in better volume. Supplies of steelmaking grades, however, are just about balancing current requirements, leaving little for stock. Prices of the principal grades are unchanged. Recent higher prices on low phos scrap have increased the flow to the extent that two buyers are now out of the market and prices have eased off again. Bar crops, cast steel, punchings and plate scrap are now $34 to $34.50; electric furnace bundles, $34.

New York — Brokers here have advanced their prices 50 cents a ton on the principal steel mill grades. This has not been reflected yet in the buying prices of the mills, and possibly may not be, as the higher prices appear to be resulting from difficulty encountered in developing tonnage due, against orders already accepted. This difficulty is ascribed in part to recent inclement weather. Heavy melting steel, No. 1 busheling, and Nos. 1 and 2 bundles are now quoted $26.50 to $27; No. 3 bundles, $24.50 to $25. Malleable also has been revised, with dealers paying $37 to $38. The major cast iron grades and low phos scrap are unchanged.

Boston — Although steel scrap has not weakened, resistance to further advances is apparent and quotations are steadier. However, $26.55, fob, was paid recently for Navy scrap and $22.50 for top grade short shoveling turnings. There is a range in this grade, however, with $21 paid. The spread also applies to regular machine shop turnings at $19 to $20.50. Despite improving supply of pig iron, No. 1 cupola cast is stronger at $42, delivered.

Buffalo — Breaking away from the wartime price tie with other steelmaking grades, No. 1 heavy melting scrap has jumped to a range of $32-33 a ton, compared with $29 for No. 2 material. Dealers, however, claim that consumers are willing to pay more for a tonnage lot of No. 2 material, but that tonnage is not available. Dealers report urgent bidding and more complaints over purchases made in the Rochester and Syracuse areas by Pittsburgh mills. Supplies from these territories usually move into the Niagara Frontier area. According to reports, Pennsylvania consumers are absorbing the freight charges in order to get material. This practice is blamed for a desperate supply situation among mills here. One of the top mill consumers is on the verge of shutting down furnaces because of insufficient scrap.

Cleveland — Shipments of iron and steel scrap into this area have increased sharply since the first of the year. The increased flow is attributed to liquidation of scrap supplies accumulated at plants to take advantage of the present price levels. There is a feeling here that lower prices may prevail by Feb. 15. By that time, mills are expected to have replenished stocks and to have started curtailing their heavy purchases. Although stocks are still below normal, the average has risen to around 30 days' needs. No. 1 heavy melting steel is selling here at a range of $30 to $32.50 a ton.

Detroit — Quotations on open-hearth grades are holding at around $27.50 per ton. Local mills for the first time in years are buying fob consuming point, resulting in a variable increase over STEEL's published prices which historically have been on a basis of dealers' buying prices, fob shipping point. The old Detroit switch of 50 cents a ton no longer applies, freight in some cases amounting to $1 a ton or more. Bulk of production scrap continued to be channeled by sources, and tonnages from dealers which have been moving on so-called "exchange deals" of scrap for finished steel are apparently drying up. The two-week closing of most General Motors plants for inventory and model change will deplete

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crap stocks moving this month, probably
y 30 to 40 per cent. Further easiness in
rices of cast scrap is being hinted.

Chicago — While scrap is moving in
etter volume at steady prices, quantity
s still disappointing to consumers who
re trying not only to maintain high pro-
uction levels but to improve their inven-
ory situation. Open-hearth scrap is avail-
ble at $30 in volume to permit meeting
f melting demands and lay small
mounts in stock. However, stocks are
ncomfortably low. Foundry scrap is in
eavy demand.

Birmingham — The district's scrap
arket, while still "tight," has eased
omewhat from last week with a slightly
ore representative flow of tonnage.
Dealers and brokers admit the higher
rice structure has failed to bring scrap
ut in anticipated quantities, but im-
rovement is noted in heavy melting and
n some grades of cast metals.

Seattle — Higher prices have failed to
ring much steel scrap out of the country
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ot into full swing in this area but this
ource is expected to be of importance in
he near future. A Portland, Oreg., firm
as six aircraft carriers to break and
hese will furnish considerable scrap.
he breaking program to date has in-
olved small vessels, producing in-
fficient material to supply demand.
Heavy melting steel scrap is quoted
19.00; No. 3 bundles, $17.00; machine
hop turnings and mixed borings and
rnings, $11.50. Punchings and plate
crap and cut structurals are quoted
21.50. No. 1 cupola cast, malleable
nd clean auto cast are quoted $27.50
hile stove plate is $25.50; No. 1 wheels,
24; charging box cast, $22.50; heavy
reakable and unstripped motor blocks,
21.50. In grades of railroad origin, the
arket is quoted $27.50 for malleable.
21.50 for angles and splice bars and
20 for No. 1 heavy melting railroad
eel and rails, random lengths.

ron Ore . . .

Iron Ore Prices, Page 128

Birmingham — Iron ore mines near
adsden, Ala., closed since World War I,
ve been returned to production by Eto-
h Coal & Iron Co. The mines are said
produce an exceptionally fine grade
ore with an output of 1000 tons daily,
L. Bains, the general manager, an-
unced. Mining engineers have estimat-
the deposit of ore on the property at
million tons.

lonferrous Metals . . .

Nonferrous Prices, Page 132

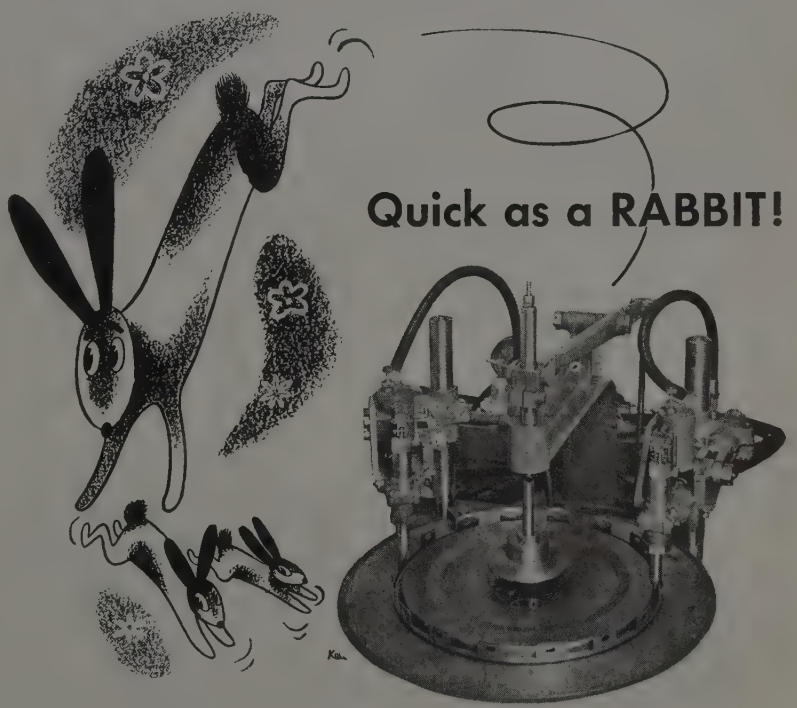
New York — Continued weakness in
ver last week was attributed to lack of
mand by commercial users, especially
welers, coupled with substantial offer-
gs. The price dropped to 81.50c per
e ounce, the lowest level attained since
t July when the price jumped from
.75c to 90.12½c. Prices of other pri-
ary nonferrous metals held steady.

Copper — Substantial tonnage of for-
gn copper on export account has been
d at 20.00c, fas New York, an advance
¼-cent. The government's stockpile
of foreign metal is dwindling and at the start of the year approximated 63,000 tons, a decline from 124,853 tons starting Dec. 1. This tonnage does not include copper coming through under contracts placed late last year which will continue through first quarter.

Production last year totaled 650,726 tons of crude copper and 604,071 tons of refined. Total shipments amounted to 1,268,830 tons compared with 1,517,842 tons in 1945.

Zinc — Sheet zinc in carloads has been advanced $2 a ton to 15.50c, fob mill, by the American Zinc Products Division, Ball Bros. Co. Other producers have raised prices, one $7 a ton on sheet zinc to 15.75c and ribbon zinc $5 to 14.75c. New list of extras for less than carlots on sheet zinc range from $1.25 per 100 pounds, 18,000 pounds and under 30,000 pounds, to $6 for less than 100 pounds. Two price levels also exist on zinc boiler plates, some quoting 13.25c for small plates and 14.25c for large while other producers are from ¼-cent to 1.75-cent higher.

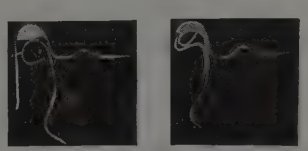
Lead — Sales by War Assets Administration of surplus battery-lead scrap, antimonial lead and solder, formerly restricted to smelters and refiners, may now be made without restriction. With the recent lifting of CPA lead controls and the granting of many appeals for employing 50-50 solder for electrical uses, the restriction is no longer necessary.



DAREX "Flowed-In" Sealing Compounds are designed to be applied at high speeds to increase the efficiency of your production line. As steel pail covers rotate beneath a nozzle, DAREX Compounds are "flowed-in" to the cover grooves in liquid form. The water content is then expelled by evaporation which thoroughly sets the compound and makes a sealing medium that becomes an integral part of the cover itself — a continuous seal that can't fall out!

Steel pail covers gasketed at the rate of 30 to 90 per minute means *better* steel pails and greater economy for you.

A product of
DEWEY and ALMY
CHEMICAL COMPANY
Cambridge 40, Mass.



DAREX "FLOWED-IN" COMPOUNDS MEAN BETTER STEEL PRODUCTS OF ALL KINDS

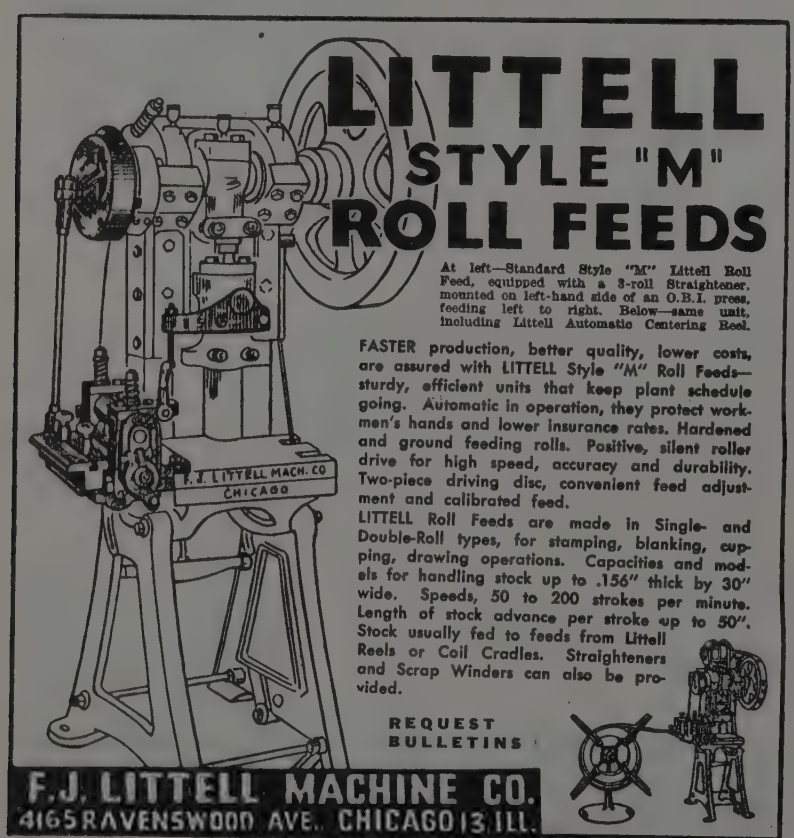
Higher Tool Steel Prices To Be Effective April 1

Vanadium-Alloy Steel Co., Latrobe, Pa., has revised its prices for tool steels. The new price list will be effective against all orders shipped after Apr. 1. The changes in these prices essentially cover the 8.2 per cent price adjustment heretofore added to the net and which is being dropped when the new prices go into effect.

The company also issued new extra lists covering both high-speed and carbon tool steel and which will become effective Apr. 1. Publication of the new extras marks the first revision made in such lists since 1933.

The list of revised base prices covers all of the company's standard brands of tool steel. Base prices of high-speed steels include the following: 18-4-1 type, 74.00c; 18-4-2, 85.00c; 18-4-1 type plus 5 per cent cobalt, $1.21; 18-4-2 type plus 8 per cent cobalt, $1.45; 20-4-2 type plus 12 per cent cobalt, $2.42; high carbon tungsten cobalt, containing 5 per cent vanadium, $1.50; 6-6-2 type, 63.00c; 6-6 type with 4 per cent vanadium 80.00c; Momax and molybdenum vanadium types, 59.00c; tungsten hot work die steel with nickel, 80.00c; 12 per cent chrome, 12 per cent tungsten hot work die steel, 70.00c; low-carbon, 14 per cent tungsten hot work die steel, 61.00c; medium carbon, 14 per cent tungsten hot work die steel, 61.00c; 9 per cent tungsten hot work die steels, 56.00c; high carbon, high chrome die steel (oil and air hardening types), 47.00c.

The list of standard carbon tool steels include the following: Best quality carbon vanadium tool steel, 25.50c; best quality carbon tool steel, 24.00c; extra quality carbon vanadium tool steel, 21.50c; extra quality carbon tool steel, 20.00c; standard quality carbon vanadium tool steel, 17.50c; standard quality carbon tool steel, 16.00c; carbon tool steel with 0.5 per cent vanadium, 26.00c; oil hardening manganese type tool steels, 26.00c; 5 per cent chrome air hardening die steel, 26.00c; silico-manganese tool steels, 16.00c; tungsten shock resisting tool steel, 30.00c; low tungsten die steel, 5 per cent hot work die steel, 1 per cent carbon and 4 per cent chrome hot work die steel, and chrome vanadium tool steel, 26.00c; chrome nickel molybdenum tool steel, 16.00c; Molybdenum tool and die steel, 18.00c; chrome tool and die steel, 15.-50c.


LITTELL
STYLE "M"
ROLL FEEDS
At left—Standard Style "M" Littell Roll Feed, equipped with a 3-roll Straightener, mounted on left-hand side of an O.B.I. press, feeding left to right. Below—same unit, including Littell Automatic Centering Reel.
FASTER production, better quality, lower costs, are assured with LITTELL Style "M" Roll Feeds—sturdy, efficient units that keep plant schedule going. Automatic in operation, they protect workmen's hands and lower insurance rates. Hardened and ground feeding rolls. Positive, silent roller drive for high speed, accuracy and durability. Two-piece driving disc, convenient feed adjustment and calibrated feed.
LITTELL Roll Feeds are made in Single- and Double-Roll types, for stamping, blanking, cupping, drawing operations. Capacities and models for handling stock up to .156" thick by 30" wide. Speeds, 50 to 200 strokes per minute. Length of stock advance per stroke up to 50". Stock usually fed to feeds from Littell Reels or Coil Cradles. Straighteners and Scrap Winders can also be provided.
REQUEST BULLETINS
F. J. LITTELL MACH. CO. CHICAGO
F.J. LITTELL MACHINE CO.
4165 RAVENSWOOD AVE., CHICAGO 13, ILL.

Rails, Cars . . .

Track Material Prices, Page 127

New York — Domestic freight cars awarded last year totaled 68,937, according to final returns of the American Railway Car Institute. This compares with 45,432 cars as compiled by STEEL for 1945. December awards amounted to 3046 freight cars, as compared with 6705 in the preceding month.

Domestic freight cars on order unfilled as of Jan. 1, amounted to 68,667, of which 48,387 are commercial shops and 20,280 in railroad shops. Domestic freight cars delivered last year, according to the Car Institute, totaled 41,955.

Value of unfilled orders at the end of last year, including all types of car equipment, and for both domestic and foreign account, amounted to $692 million, against $390 million a year earlier.

During the past year 1832 passenger cars were placed, including 62 with railroad company shops. However, passenger cars actually on order and undelivered at the end of the year, amounted to 3347, of which 154 are to be built in railroad company shops.

Foreign orders in 1946 involved 42,045, mostly for French account, as export car construction was greatly delayed throughout the year, 32,275 were still on order and undelivered at the beginning of this year.

Following is a comparative table, covering domestic freight car awards over recent years:

	*1946	1945	1944	1943
Jan.	2,050	7,200	1,020	8,365
Feb.	2,403	1,750	13,240	350
March	4,516	2,500	6,510	1,935
April	3,764	1,120	4,519	1,000
May	3,025	1,526	1,952	870
June	3,334	670	1,150	50
July	15,236	3,500	795	4,190
Aug.	9,530	7,240	8,900	8,745
Sept.	12,737	12,840	400	6,820
Oct.	3,407	1,320	2,425	5,250
Nov.	6,705	1,650	1,065	870
Dec.	3,046	4,116	16,245	2,910
Total	68,937	45,432	53,221	41,370

* American Railway Car Institute.

While domestic freight car awards since the turn of the year have been light there is a substantial accumulation of inquiry which should develop into active trading within the near future. The largest single list involves 6200 freight cars, noted in last week's issue as pending for the Southern Pacific.

Locomotive inquiry involves 10 diesel-electric engines for the Seaboard Air Line, comprising six road locomotives and four switchers. Ten locomotives, all steam, are also pending for the Chesapeake & Ohio. The Leopoldina Railway, Brazil, has closed on eight 2-8-2 type locomotives, to the Baldwin Locomotive Works, Eddystone, Pa.

Pittsburgh—Freight car builders to meet projected 1947 domestic freight car construction program of 84,000 units (double the 41,955 built last year) materials are made available. The Steel Industry Advisory Committee has appointed a task committee to prepare a detailed analysis of the steel product requirements, expected to approximate 7 million net tons, to meet this program of 7000 cars monthly. Steel industry officials expect to allocate this tonnage on a voluntary basis rather than under a government sponsored directive system. Most of the steel requirements for foreign orders still on car builders' boo

are expected to be shipped this month and fabrication of these cars should be completed by end of first quarter.

Export Base Prices Revised By U. S. Steel Subsidiary

United States Steel Export Co., 30 Church St., New York, a subsidiary of the United States Steel Corp., is now quoting the following export base prices per 100 pounds of carbon steel in carload quantities, fob mill, with freight included to New York, Philadelphia and Baltimore seaports — all net cash: Plates, $3.28; floor plates, $4.53; structural shapes, $3.03; merchant bars, $3.28; reinforcing bars, $3.13; sheet piling, $3.53; hot-rolled sheets 10G, $3.21; hot-rolled sheets 24G, $4.11; cold-rolled sheets M/R 17G (2 ton packages), $4.11; galvanized sheets plain 24G, $5.08; galvanized sheets, corrugated 24G, $5.08; hot-rolled strip, $3.03; cold-rolled strip, $3.73; bright nail wire, $3.83; black annealed wire, $4.48; galvanized plain wire, $4.93; wire nails, $4.30; bright staples, $5.10; galvanized staples, $5.75; and skelp, $2.88.

Prices quoted on other products are: Tin plate, coke, 107-pound, $6.63 per base box; galvanized wire, 80-rod spool, Lyman 4pt-5-in., $4.65, Glidden 2pt-4-in., $4.27.

Semifinished material is quoted, per gross ton, at $44.39 for ingots, $52.39 and $60.39, respectively, for rerolling and forging quality billets, blooms, and slabs. Rails are quoted on a net ton basis at $63.08 for standard rails, over 60 pounds; $67.35 for light rails, 60 pounds and lighter; $69.60 for girder rails. Joint bars for standard rails and tie plates are quoted $3.95 per 100 pounds.

Discounts from list prices are as follows on American standard pipe, threaded and coupled: 1 to 3-inch, black buttweld, 55.2 per cent; 1 to 3-inch galvanized buttweld, 42.2 per cent; 3½ to 6-inch, black seamless, 51.7 per cent; 3½ to 6-inch galvanized seamless, 38.2 per cent. English gas tubes, ⅜ to 3-inch, are quoted 55½ per cent off list on black and 45½ per cent off list on galvanized.

Freight Rate Cut Sought On Shipments to West Coast

Pittsburgh — Lower freight rate schedules on shipments of steel from Geneva, Utah, to West coast have been filed with Interstate Commerce Commission by the Western Pacific, Great Northern, Denver & Rio Grande Western, and Union Pacific railroads. The new freight rate, scheduled to become effective about Mar. 1 unless opposed by ICC, will be 48 cents per 100 pounds in carload lots. This compares with former rate of 60 cents to which 10 cents additional is now in effect as result of countrywide freight rate advance Jan. 1.

Under government operation throughout the war, Geneva Steel Co. shipped to West coast on basis of $8 per ton in carlots, a reduction of $4 from former rate level. When Geneva Steel was purchased by U. S. Steel Corp., the $12 freight rate once more became operative. Probable new rate of $9.60 per ton reflects the $4 reduction sought by company officials plus general 20 per cent increase recently granted all carriers.

The Western Pacific and the Denver & Rio Grande have filed the new rates for shipment to San Francisco; Union Pacific to Los Angeles and Portland; and Great Northern to Portland. Previous differential of 6 cents or $1.20 a ton for shipments to Seattle and Tacoma, Wash., is still in effect but may be dropped. The new freight rate from Geneva does not apply on Southern Pacific or Santa Fe lines.

A number of trucking lines established an $8 per ton freight rate schedule from Geneva to West coast about Nov. 22 last. To date none of these firms have increased this rate, although ICC's action in granting the 20 per cent increase to railroads Jan. 1 authorizes same advance for truck movement.

Canada . . .

Toronto, Ont. — With Canadian mills now operating around the 75 per cent mark, deliveries of iron and steel again are on a more normal basis. However, there has been little easing in supply. Backlogs are sufficient to absorb all production for the first half of this year and some of the orders constitute a carryover from the first quarter of last year. At the present time, most Canadian steelmakers are booked solidly to the end of June; new orders are being accepted on a basis of a "no promise delivery and price" at time of shipment.

Despite the price situation, consumers are anxious to place orders and big tonnage business is pending from various sources across the Dominion. There has been no change in price ceilings with the result that Canadian quotations are far out of line when compared with those prevailing in the United States.

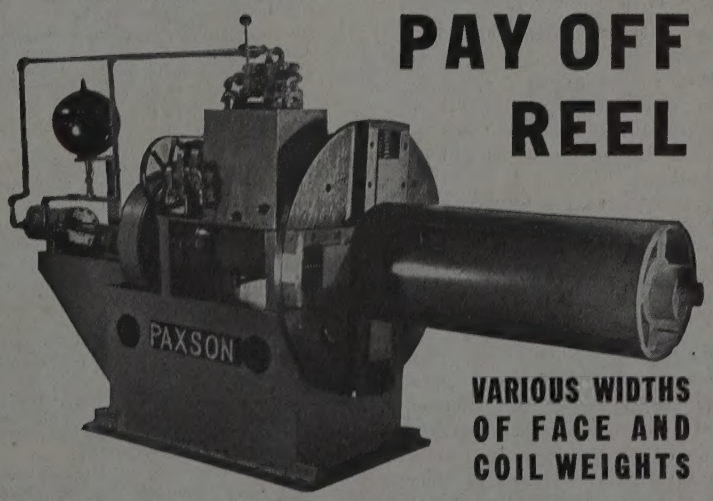
Improvement in raw material deliveries to consuming plants during the past two or three months has been reflected in favorable increases in production schedules by makers of consumer goods. However, the supply of consumer goods on the market has not shown much improvement; some goods are being withheld, it is reported, in the expectation that price ceilings may soon be raised. Intimations have been forthcoming from government sources to the effect that ceiling prices soon will be increased on many items and action of this nature may develop within the next two or three weeks.

Demand for steel sheets is exceptionally heavy. While producers have been steadily increasing output, they still are several months behind in meeting all commitments. Mills are booked solidly on sheets to the end of June.

Iron and Steel Production Rises Further in Canada

Toronto, Ont. — Iron and steel production in Canada moved sharply upward in November, indicating that steel mills in this country have almost fully recovered from the 81-day strike which

HERE IT IS
PAXSON HYDRAULIC
PAY OFF
REEL



VARIOUS WIDTHS
OF FACE AND
COIL WEIGHTS

BUILDERS OF COMPLETE SLITTING LINES

PAXSON MACHINE CO.
SALEM, OHIO

curtailed operations from the middle of July.

Pig iron output advanced to 135,269 tons in November, which was 58.5 per cent of capacity and compares with 74,958 tons or 32.4 per cent in October. Production for November included 105,643 tons of basic iron, of which 2427 tons were for sale and the balance for further use of producing companies; 16,659 tons of foundry iron, all for sale and 12,967 tons of foundry iron, all for sale.

Production of ferroalloys also moved upward in November to 9370 net tons and included ferrosilicon, silicomanganese, ferromanganese, ferrochrome, and ferrophosphorus.

Output of steel ingots and castings totalled 222,644 net tons in November or 73.3 per cent of capacity and compares with 123,841 tons in October, when the rate dropped to 41 per cent, and with 25.3 per cent in September.

Changes Made in Extras on Hot-Rolled Plain Plates

(*Concluded from Page* 46)

standard mill loading practice of under 5 ton lifts, the following extras apply: 1 net ton, 20 cents, 2 net tons, 15; 3 and 4 net tons, 10 cents.

Special sheared floor plates are furnished within shearing variations as shown in AISI Steel Products manual, and extras for same have been incorporated in the new extra card. Special shearing extra of 20 cents is now charged for 5/16-in. and heavier; 40 cents for under 3/16 to 1/8-in. inclusive.

Extras covering special marking, bundling, and protection from the weather coincide with those for plain plates.

Clarify Extra Cards for Hot-Rolled Carbon Bars

(*Concluded from Page* 47)

chemical limits. This class of material is produced from special bar quality steel with special manufacturing control to obtain specified mechanical requirements by conventional quenching and tempering practice.

RESTRICTED INCIDENTAL ELEMENTS: In special bar quality steels, any limiting maximum requirement for copper, nickel, chromium or molybdenum requires special control of raw materials by the producer. For special applications, the following restrictive maximum limits may be specified: Copper 0.10 max; Nickel 0.10 max; Chromium 0.07 max; and Molybdenum 0.04 max. No minimum content may be specified or implied for any incidental element in carbon steel bars.

OTHER RESTRICTIVE REQUIREMENTS: Any other restrictive requirement on special bar quality steel which is not described herein or anticipated is subject to negotiation between the purchaser and producer.

PLATES . . .

PLATES PENDING

Unstated, 31,000 feet, 9-inch steel water pipe; bids in at Cottage Grove, Oreg.

Unstated, 96-inch diameter steel siphon, with supports and plates; bids to Bureau of Reclamation, Denver, Feb. 5; Spec. 1646.

Unstated tonnage, 200,000-gallon water tank, David Taylor model basin, Carderock, Md.; bids Jan. 22, public works office, Naval Gun Factory, Washington.

STRUCTURAL SHAPES . . .

STRUCTURAL STEEL PLACED

500 tons, sheet piling, jetties, Lincoln Park, Chicago, for Chicago Park District, to Carnegie-Illinois Steel Corp., Chicago; Great Lakes Dredge & Dock Co., Chicago, contractor; bids Dec. 23.

250 tons, manufacturing building, Rockford, Ill., for Rockford Screw Products Co., to Mississippi Valley Structural Steel Co., Decatur, Ill.; Linden & Sons Inc., Rockford, Ill., contractor.

250 tons, sheet piling, Chicago, for Atchison, Topeka & Santa Fe railroad, to Carnegie-Illinois Steel Corp., Chicago.

134 tons, steel storage building, Chicago, for Wilson Steel & Wire Co., to Mississippi Valley Structural Steel Co., Decatur, Ill.

110 tons, Central valley project, spec. 1535, Bureau of Reclamation, Denver, to American Bridge Co., Denver.

STRUCTURAL STEEL PENDING

5500 tons, veterans hospital, Buffalo, steel bids Jan. 15, Army Engineers office.

2500 tons, trestle, Woodlawn, S. C., for U. S. Engineer.

2010 tons, superstructure, bridge, Passaic river, Clifton-Rutherford, N. J., double leaf bascule span and six fixed spans, total length 700 feet. Other requirements, 123 tons operating and lock machinery, 82 tons trunnions and trunnion bearings, 216 tons reinforcing steel, and 12,560 sq. ft. roadway and sidewalk grating.

1500 tons, DPG bridge over Clearwater river, Lewiston, Idaho.

1100 tons, Public School No. 157, Queens, New York City, bids asked.

994 tons, coffer dam, Spec. 1571, Shasta dam, Central Valley, Calif., for Bureau of Reclamation; American Bridge Co., Pittsburgh, low; bids to Denver Jan. 6.

900 tons, extension of sludge disposal building, Div. Qb. West-Southwest sewage treatment works, Chicago, for Sanitary District of Chicago; Bethlehem Steel Co., Bethlehem, Pa., sole bidder; bids Jan. 9.

700 tons, extension to power plant, Tecumseh, Kans.

600 tons, tunnel, Urbana, Ill., for University of Illinois; L. Balkin Builder Inc., Chicago, low on general contract; bids Jan. 6.

460 tons, theater in Mexico.

425 tons, restaurant and office building, Chicago, for Jewel Building Corp.; bids Jan. 10.

344 tons, addition to paper mill, Tuscaloosa, Ala.; H. K. Ferguson Co., Cleveland, contractor.

228 tons, sheet piling, Ludington, Mich., for U. S. Engineer, Milwaukee; new bids Jan. 20.

206 tons, machine shop, Spec. 1567, Grand Coulee dam, Odair, Wash., for Bureau of Reclamation; Worden-Allen Co., Milwaukee, low; bids to Denver Jan. 6.

185 tons, bridge, Sec. 3F, Marshall county, Ill., for State Highways Division; Illinois Steel Bridge Co., Jacksonville, Ill., low; bids Jan. 10.

120 tons, bridge, Sec. 43F, Pike county, Ill., for State Highways Division; Illinois Steel Bridge Co., Jacksonville, Ill., low; bids Jan. 10.

112 tons, stop logs, Spec. 1560, Grand Coulee dam, Odair, Wash., for Bureau of Reclamation; Consolidated Steel Corp., Los Angeles, low; bids to Denver Jan. 2.

105 tons, Rock Island arsenal, Ill., inv. 56; bids in.

Unstated, 14-ton gantry crane and 30-ton overhead traveling crane; bids to Bureau of Reclamation, Denver, Feb. 11.

Unstated, five steel arch rib huts, Missouri Basin projects; bids to Bureau of Reclamation, Billings, Mont., Feb. 3.

REINFORCING BARS . . .

REINFORCING BARS PENDING

400 tons, women's residence hall, Urbana, Ill., for University of Illinois; general contract to Warner Construction Co. Inc., Chicago; bids Dec. 6.

213 tons, including 150 tons wire mesh and 63 tons bars, Contract 2794, Marion county, Ind., for State Highway Commission; McCalman Construction Co., Danville, Ill., low on general contract; bids Jan. 7.

160 tons, expansion, Michigan City, Ind., for Indiana State Prison; bids Nov. 15 rejected; project postponed indefinitely.

151 tons, including 100 tons wire mesh and 51 tons bars, Contract 2791, Kosciusko county, Ind., for State Highway Commission; Gast Construction Co., Warsaw, Ind., low on general contract; bids Jan. 7.

Unstated, seven building projects, University of Washington; bids to Seattle, various dates prior to Mar. 15.

Unstated, state highway headquarters, Seattle; S. S. Mullen, Seattle, low, $674,553.

PIPE . . .

STEEL PIPE PLACED

100 miles, 26-inch welded pipe, El Paso Natural Gas Co., to Consolidated Steel Corp.; estimated price, over $2½ million; delivery in 1947. Consolidated was previously awarded contract (for the same 1200-mile California-Texas natural gas line) for 214 miles by California Gas Co. and Southern Counties Gas Co.

STEEL PIPE PENDING

Unstated, Washington state fish rearing facilities, Bowman's Bay station; A. W. Stevens Construction Co., Mt. Vernon, Wash., low, $171,188.

CAST IRON PIPE PLACED

275 tons, Perkins Lane project, Seattle, to H. G. Purcell, Seattle, for U. S. Pipe & Foundry Co., Burlington, N. J.

CAST IRON PIPE PENDING

750 tons, various sizes, for Spokane, Wash., bids Jan. 23.

RAILS, CARS . . .

LOCOMOTIVES PLACED

Leopoldina Railway, Brazil, eight 2-8-2 type locomotives, to Baldwin Locomotive Works, Eddystone, Pa.

LOCOMOTIVES PENDING

Chesapeake & Ohio, 10 steam locomotives, bids asked.

Seaboard Air Line, 10 diesel-electric locomotives, comprising six road engines and four switch engines, bids asked.

RAILROAD CARS PLACED

Pennsylvania railroad, 32 passenger cars; 31 to American Car & Foundry Co., New York and one to Budd Co., Philadelphia.

RAILROAD CARS PENDING

Southern Pacific, 500 automobile cars and 50 track cars, bids asked; these are in addition to 5200 miscellaneous cars noted as pending in last week's issue.

Track for maintenance, New York City Board of Transportation; bids Jan. 30.

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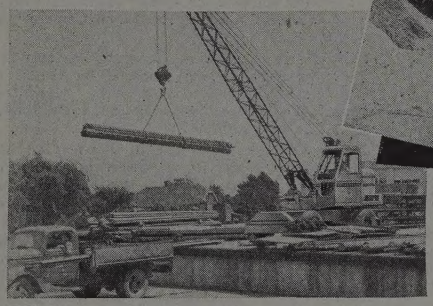
UNIT 357 Clamshell unloading sand.

UNIT 357 Magnet used in loading scrap metal.



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CONSTRUCTION AND ENTERPRISE

ALABAMA

SYLCAUGA, ALA.—B & M Construction Co., Oklahoma City, Okla., has been awarded contract at $578,570 for natural gas distribution system. J. W. Goodwin Engineering Co., Birmingham, engineer.

SILURIA, ALA.—Buck Creek Cotton Mills has received CPA approval for construction of addition to cotton mill plant and also addition to machine shop, to cost $108,000. Pembleton & Mims, Birmingham, architects.

ARKANSAS

NORTH LITTLE ROCK, ARK.—Leylind Mfg. Co., 622 E. Markham St., Little Rock, Ark., plans construction of plant, to cost $350,000.

CALIFORNIA

LOS ANGELES — Greenfield Tool & Stamping Corp. has been organized with $100,000 capital to manufacture stamping dies, mill fixtures, drills, tools and jigs, by Dave F., Donald F. and Russell Smith, 922 Citizens National Bank Bldg. Directors are: Anton Greenfield, John F. Sullivan and L. B. Bender.

CONNECTICUT

EAST HARTFORD, CONN.—Pratt & Whitney Division, 400 Main St., has awarded contract for x-ray laboratory to Green & Odegard, 119 Ann St., Hartford, Conn., for an estimated $55,000.

ESSEX, CONN.—E. E. Dickinson & Co., N. Main St., has awarded contract for four-story factory to Associated Construction Co., 738 Main St., Hartford, Conn., for an estimated $150,000. Westcott & Mapes, 109 Church St., New Haven, Conn., architects.

WALLINGFORD, CONN.—American Cyanamid Co., 30 Rockefeller Plaza, New York, has awarded contract for construction of three-story, 60 x 100-foot factory, S. Cherry St., to Frank P. Sullivan Inc., 110 Tyler St., New Haven, Conn., for $187,000.

INDIANA

INDIANAPOLIS — Dunnington Mfg. Co. Inc., 1107 E. 54th St., has been formed with 4000 shares of $25 par value stock to manufacture implements, mechanical apparatus and appliances by Edwin T., Thalia E. and Guy W. Dunnington.

MISHAWAKA, IND. — Northern Indiana Iron Works Inc., South Union St., has been organized with 1000 shares of no par value to manufacture castings and other steel products, by W. H. Edwards, William T. Oare and Mollie Messner.

OSGOOD, IND.—Walter S. Hallawell Inc., has been organized with 1000 shares of no par value to manufacture metal castings, mechanical appliances and machinery, by Walter S., Mary L. and Mary E. Hallawell.

WEST LAFAYETTE, IND. — General Time Instruments Corp., New York, has purchased a 20-acre tract here which will be used as a site for a new factory.

KENTUCKY

COVINGTON, KY.—Klaene Foundry Co. Inc., Frank A. Klaene, treasurer, recently suffered damage estimated at $125,000 by fire.

LOUISIANA

STERLINGTON, LA. — Commercial Solvents Corp., P. O. Box 1471, Monroe, La., has awarded contract to Ford, Bacon & Davis Construction Corp., Monroe, for construction of plant, estimated to cost $254,870.

MARYLAND

BALTIMORE—C. Hoffberger Co., Monument & Forrest Sts., will construct fuel oil tank at 1020 N. Linwood Ave., to cost $20,000. Owner builds.

BALTIMORE—McNamara & Co., Clarkson and McComas Sts., has awarded separate contracts for one-story, 86 x 202-foot steel tank manufacturing plant, to cost $150,000.

MASSACHUSETTS

EVERETT, MASS.—Monsanto Chemical Co., Chemical Lane, plans construction of factory to cost $182,100. J. R. Worcester & Co., 79 Milk St., Boston, architect.

FALL RIVER, MASS.—Sterling Ring Traveler Co., 101 Lindsey St., has awarded contract for one-story factory addition including hardening furnaces to Fred J. Rudd Co., 534 Westamoe St., for an estimated $55,000. I. T. Almy, 56 N. Main St., architect.

MICHIGAN

CLARE, MICH. — Clare Mfg. Co. has awarded contract for construction of a $100,000 factory building to Moline Construction Co., Clare.

DEARBORN, MICH. — Universal Products Co. Inc. is having plans prepared by Giffels & Vallet Inc. and L. Rossetti, associated architects and engineers, Detroit, for a $484,000 factory addition.

DETROIT — Consolidated Brass Co. has awarded contract for construction of foundry addition to cost $107,000 to Campbell Construction Co., Detroit.

DETROIT — Reflecting Sign Corp., 4430 Vancouver Ave., has been organized with $100,000 capital to manufacture signs, by Hazen C. Baron, 25471 Outer Drive W.

DETROIT — Tim Products Co., 816 Penobscot Bldg., has been formed with 10,000 shares of no par value to manufacture metal and plastic products, by Marion L. Johnston, 29850 Franklin Rd., Birmingham, Mich.

DETROIT — Michigan Iron & Steel Corp., 2533 Barlum Tower, has been organized with $50,000 capital to manufacture iron and steel products, by William B. Giles, same address.

DETROIT — Hawk Tool & Engineering Co. Inc., 7663 Epworth Ave., has been organized to deal in tools, dies and metal products, by Allen E. Hawk, 15067 Warwick.

EAU CLAIRE, MICH. — Love Industries Inc. has been organized with $500,000 capital to manufacture hydraulic and mechanically operated lifts and hitches, by Jabex A. Love.

GRAND RAPIDS, MICH. — Paneva Corp., 300 Michigan Trust Bldg., has been formed with $50,000 capital to manufacture fabricated products, by Harold S. Sawyer Jr., same address.

JACKSON, MICH. — Bryant Products Co., 297 W. Michigan Ave., has been formed with $50,000 capital to manufacture production machinery, by W. S. Ritchie, 244 W. Cortland.

LAKE ODESSA, MICH. — Lake Odessa Machine Products Inc., 1131 Fourth Ave., has been organized with $50,000 capital to manufacture metal stampings, jigs, tools and dies, by John J. Smith, 801 National Bank Bldg., Jackson, Mich.

SCHOOLCRAFT, MICH. — Industrial Foundry & Mfg. Co. has been organized with $50,000 capital to manufacture machinery and equipment, by Garrett Mastenbrook, RFD No. 5, Kalamazoo, Mich.

OHIO

ALLIANCE, O. — Lewis Engineering & Mfg. Co., S. Mahoning Ave., plans construction of a 102 x 160-foot addition which will double the productive capacity of its plant.

AVON LAKE, O. — Cleveland Electric Illuminating Co., Cleveland, has ordered another 90,000 kw turbogenerator for its local plant, at a cost of about $13 million. A similar generator was bought for the same plant last summer. Total cost of the two generators and facilities is estimated at $25 million.

CAMBRIDGE, O. — Kingston-Conley Electric Co., Plainfield, N. J., subsidiary of Hoover Co., N. Canton, O., has acquired a local site on which will be located a new plant to manufacture fractional horsepower motors.

CLEVELAND — E. W. Ferry Screw Products Inc., 8219 Almira Ave., has acquired a 26-acre tract on Smith Rd. which it plans to use as the site for a proposed new plant.

CLEVELAND — Betz Pierce Co., 1284 E. 53rd St., plans construction of a steel warehouse to cost $98,612 at E. 53rd St. and Hamilton Ave.

CLEVELAND — Knutsen Machine Products Inc. has been organized with $25,000 capital by John Knutsen, Knutsen Industries Inc., 15020 Miles Ave.

LOUDONVILLE, O. — Flxible Co. recently suffered a fire in its paint department, engineering and service section which caused damage estimated at more than $1 million.

MAYFIELD HEIGHTS, O.—Diamond Alkali Co., 2400 Oliver Bldg., Pittsburgh, plans construction of research and administration center, to cost $2 million, on 83-acre tract on Mayfield Rd. near SOM Center Rd. Previous plans to locate in Euclid, O., (STEEL, Dec. 16, 1946, p. 172) have been abandoned.

WOOSTER, O. — Duralex Co., affiliated with Buckeye Aluminum Co., Spruce St., has been organized with $200,000 capital to manufacture and distribute housewares and electrical appliances, with Ross K. Schoolroy as president.

PENNSYLVANIA

COATESVILLE, PA.—Lukens Steel Co. has awarded contract for pickling tank building to Lehigh Engineering Co., 1150 Mauch Chunk Rd., Bethlehem, Pa., for $177,000.

LESTER, PA.—Westinghouse Electric Corp. has awarded contract to own forces for alterations and addition to Bldg. R to cost over $83,000.

NORRISTOWN, PA. — Philadelphia Electric Co., Philadelphia, has awarded contract for construction of two additional electric generating units at its Barbadoes island plant near here to Dravo Corp., Pittsburgh. Total cost of plant with equipment will be $17 million. Contract for turbines has been awarded Westinghouse Electric Corp., Pittsburgh; motors and transformers will be supplied by General Electric Co., Schenectady, N. Y.; and Foster Wheeler Corp., New York, will furnish boilers.

PHILADELPHIA—Gulf Oil Corp., 30th and Penrose Aves., has awarded contract for construction of refinery to Lummus Co., 420 Lexington Ave., New York, for $3,500,000.

PHILADELPHIA—E. I. du Pont de Nemours Co., du Pont Bldg., Wilmington, Del., will soon let contract for plant addition, to cost over $150,000.

RHODE ISLAND

PROVIDENCE, R. I. — Piling Chain Co., 140 Benedict St., has awarded contract for two-story factory addition to Westcliff Construction Co., 91 Globe St., for an estimated $65,000.

TENNESSEE

CHATTANOOGA, TENN.—Southern Railway System, c/o E. Benett, chief engineer, 101 N. Gay St., Knoxville, Tenn., has awarded contract for diesel locomotive shop, to cost $1 million, to Brice Bldg. Co., 215 S. 18th St., Birmingham.

CANADA

DEEP RIVER, ONT. — National Research Council, Sussex St., Ottawa, Ont., is planning expansion of atomic operations of Pertawana Works of Defense Industries, to cost approximately $4,500,000.

HAMILTON, ONT. — Canadian Refractories Ltd., 105 Walnut St., has awarded contract for construction of one-story, 63 x 102-foot plant, Lottridge and Clinton Sts., to W. H. Cooper Construction Co. Ltd., Medical Arts Bldg., for about $60,000.

TORONTO, ONT. — Metal Stamping Ltd., 3600 Danforth Ave., has awarded contract for rolling mill structure to Westell-Sinclair, Islington, Ont., for approximately $500,000.

ARVIDA, QUE.—Quebec Lead Smelting Syndicate, J. C. Dunlap, manager, c/o Ventures Ltd., 25 King St. W., Toronto, Ont., has awarded separate contracts for lead smelter, to cost about $1 million.